

**SECTION 00 01 01  
PROJECT TITLE PAGE**

**PROJECT MANUAL  
FOR  
GOLETA VALLEY LIBRARY ADA, SAFETY, AND BUILDING IMPROVEMENT PROJECT**

**PROJECT NUMBER: 9130  
BID NUMBER: 25-07  
DATE: OCTOBER 14, 2025**

**CITY OF GOLETA  
130 CREMONA DRIVE  
GOLETA, CALIFORNIA 93117**



**PREPARED BY:  
JEFFREY MILLER ARCHITECTURE AND DESIGN |JM+AD|  
CITY OF GOLETA**

**END OF SECTION**



**SECTION 00 01 03  
PROJECT DIRECTORY**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Identification of project team members and their contact information.

**1.02 OWNER:**

- A. Name: City of Goleta
1. Address Line 1: 130 Cremona Drive, Suite B.
  2. City: Goleta.
  3. State: CA.
  4. Zip Code: 93117.
- B. Primary Contact: All correspondence from the Contractor to the Architect will be through this party, unless alternate arrangements are mutually agreed upon at preconstruction meeting.
1. Title: General Services Director.
  2. Name: Matthew Fore.
  3. Email: MFore@CityofGoleta.gov.
  4. Phone: (805) 562-5507

**1.03 CONSULTANTS:**

- A. Architect: Design Professional of Record. All correspondence from the Contractor regarding construction documents authored by Architect's consultants will be through this party, unless alternate arrangements are mutually agreed upon at preconstruction meeting.
1. Company Name: Jeffrey Miller Architecture and Design [JM+AD].
    - a. Address Line 1: 516 N Sepulveda Blvd, Suite 201.
    - b. City: Manhattan Beach.
    - c. State: CA.
    - d. Zip Code: 90266.
    - e. Telephone: (310) 684-3550.
  2. Primary Contact:
    - a. Title: Architect of Record.
    - b. Name: Jeffrey Miller.
- B. Civil Engineering Consultant:
1. Company Name: KPFF.
    - a. Address Line 1: 700 South Flower Street, Suite 2000.
    - b. City: Los Angeles.
    - c. State: CA.
    - d. Zip Code: 90017.
    - e. Telephone: (213) 418-0201.
  2. Primary Contact:
    - a. Title: Project Engineer.
    - b. Name: Kristen Sharer.
- C. Landscape Architecture Consultant:
1. Company Name: UPLA.
    - a. Address Line 1: 4572 Via Marina, #105.
    - b. City: Marina del Rey.
    - c. State: CA.
    - d. Zip Code: 90292.



**SECTION 00 01 03  
PROJECT DIRECTORY**

**DIVISION 00**

- e. Telephone: (423) 385-8721.
- 2. Primary Contact:
  - a. Title: Landscape Architect.
  - b. Name: Stephanie Reed.
- D. Structural Engineering Consultant:
  - 1. Company Name: KPFF.
    - a. Address Line 1: 700 South Flower Street, Suite 2000.
    - b. City: Los Angeles.
    - c. State: CA.
    - d. Zip Code: 90017.
    - e. Telephone: (213) 418-0201.
  - 2. Primary Contact:
    - a. Title: Principal.
    - b. Name: Rodrigo Toro Pavez.
- E. Mechanical Engineering Consultant - Plumbing:
  - 1. Company Name: Interface Engineering.
    - a. Address Line 1: 601 S. Figueroa St. #2750.
    - b. City: Los Angeles.
    - c. State: CA.
    - d. Zip Code: 90017.
    - e. Telephone: (213) 694-3434.
  - 2. Primary Contact:
    - a. Title: Plumbing Designer.
    - b. Name: Danny Lucas.
- F. Mechanical Engineering Consultant - HVAC:
  - 1. Company Name: Interface Engineering.
    - a. Address Line 1: 601 S. Figueroa St. #2750.
    - b. City: Los Angeles.
    - c. State: CA.
    - d. Zip Code: 90017.
    - e. Telephone: (213) 694-3434.
  - 2. Primary Contact:
    - a. Title: Senior Mechanical Engineer.
    - b. Name: Hugh Kettler.
- G. Electrical Engineering Consultant:
  - 1. Company Name: Interface Engineering.
    - a. Address Line 1: 601 S. Figueroa St. #2750.
    - b. City: Los Angeles.
    - c. State: CA.
    - d. Zip Code: 90017.
    - e. Telephone: (213) 694-3434.
  - 2. Primary Contact:
    - a. Title: Senior Electrical Designer.
    - b. Name: Haoyan Huang.
- H. Accessibility, Fire Suppression, Fire Alarm and Low-Voltage Consultant:
  - 1. Company Name: Jensen Hughes.
    - a. Address Line 1: 1220 Concord Ave Suite 400.



**SECTION 00 01 03  
PROJECT DIRECTORY**

**DIVISION 00**

- b. City: Concord.
- c. State: CA.
- d. Zip Code: 94520.
- e. Telephone: (925) 434-9719.
- 2. Primary Contact:
  - a. Title: Associate.
  - b. Name: Chole Chou.

**1.04 CONSTRUCTION MANAGER:**





- A. Company Name: Kitchell CEM.
  - 1. Address Line 1: 1304 Broad Street.
  - 2. City: San Luis Obispo.
  - 3. State: CA.
  - 4. Zip Code: 93401.
  - 5. Telephone: (805) 706-0276.
- B. Primary Contact:
  - 1. Title: Project Director.
  - 2. Name: Shane Mahan, CCM.




**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION - NOT USED**

**END OF SECTION**



<p>Architect:</p> <p>Jeffrey Miller Architecture and Design [JM+AD]</p>	
<p>Civil Engineering Consultant:</p> <p>KPFF</p>	
<p>Landscape Architecture Consultant:</p> <p>UPLA</p>	
<p>Structural Engineering Consultant:</p> <p>KPFF</p>	

<p>Mechanical Engineering Consultant: Interface Engineering</p>	
<p>Plumbing Engineering Consultant: Interface Engineering</p>	
<p>Electrical Engineering Consultant: Interface Engineering</p>	



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**EXHIBITS**

- A. Limited Asbestos and Lead Assessment Survey, TRUST Environmental Solutions, dated January 3, 2025 and October 4, 2025.
- B. Goleta Water District Fire Hydrant Flow Form, dated October 30, 2024
- C. Post-Construction Waste Reduction & Recycling Summary Report (WRRS)
- D. Notification of Renovation and Demolition (ENF-28)
- E. Contract Change Order and Project Forms



**NOTICE TO CONTRACTORS  
INVITING SEALED BIDS  
GOLETA VALLEY LIBRARY ADA, BUILDING, AND SAFETY IMPROVEMENT PROJECT NO. 9130**

**PUBLIC NOTICE IS HEREBY GIVEN** that the City of Goleta ("City") invites sealed bids for the above stated project and will receive such bids via electronic transmission on the City of Goleta PlanetBids portal site until **2:00 P.M. (PST) on Tuesday, November 18, 2025**, and will be publicly opened and posted on the PlanetBids portal site promptly thereafter. Copies of the Bid and Contract Documents may be obtained from the Planet Bids Website: <https://vendors.planetbids.com/portal/45299/bo/bo-search>.

The work includes all labor, material, supervision, and equipment necessary to construct and deliver a finished **GOLETA VALLEY LIBRARY ADA, BUILDING, AND SAFETY IMPROVEMENT PROJECT NO. 9130**. Work includes the renovation of the Goleta Valley Library as further described in the Project Description.

**Project Cost**

The estimated cost of Project construction is approximately \$5 million (including all Add Alternates). The Basis of Award will be determined on the Base Bid Construction Price not including Alternate Bid Items.

**Project Duration**

The successful contractor (after receipt of Notice to Proceed) shall have **396 calendar days** to complete all work called for under the Contract Documents.

**Project Location**

500 North Fairview Avenue, Goleta, California, 93117.

**Project Description**

Renovation of an existing 15,437 square foot single-story structure to meet current Americans with Disabilities Act (ADA) standards and modern building and code requirements. The project includes ADA restroom renovations, interior and exterior path of travel alterations, electrical system replacement (including switchgear), HVAC system replacement, fire suppression system installation, LED lighting replacement and retrofits, security and life safety system installation and upgrades, installation and replacement of doors, windows, and storefront systems, fascia replacement, interior alterations and improvements, and landscape improvements.

**Questions and Communications**

All questions must be submitted electronically through PlanetBids. The deadline for receipt of questions is **5:00 P.M. (PST) on Tuesday, November 4, 2025**.

**Mandatory Pre-Bid Meeting**

Mandatory pre-bid meetings will be held at the Project Site (500 North Fairview Avenue, Goleta, California, 93117) at:

- Thursday, October 23, 2025, at 2:00 P.M. (PST)
- Tuesday, October 28, 2025, at 2:00 P.M. (PST)

Attendance at one meeting is required. Bidders must attend a pre-bid meeting, fully inspect the Project Site, and will be held responsible for all information presented. It is required that the Bidders become thoroughly familiar with the terms and conditions of the Bid Plans, Special Provisions, and Local Conditions affecting the performance and costs of the Work prior to bidding and it is recommended that this be done prior to attending the pre-bid meeting.





**SECTION 00 11 13  
NOTICE INVITING BIDS**

**DIVISION 00**

**Bid Submittal Instructions**

Bidders must be registered on the City of Goleta's PlanetBids portal in order to access all bid documents, and to receive addendum notifications and to submit a bid. Go to PlanetBids for bid results and awards. It is the responsibility of the bidder to submit the bid with sufficient time to be received by PlanetBids prior to the bid submittal deadline. Allow time for technical difficulties, uploading, and unexpected delays. Late or incomplete bids will not be accepted. All communications related to this project shall be conducted through PlanetBids. Questions about alleged patent ambiguity of the plans, specifications, or estimate must be asked before bid opening. After bid opening, the City does not consider these questions as bid protests. All bids must be submitted electronically through PlanetBids on or before **2:00 P.M. (PST) on Tuesday, November 18, 2025**. At that time, the electronic bids will be opened within the system and made publicly available in PlanetBids immediately following opening.

**Bid Security**

The bid must be accompanied by a bid security in the form of a money order, a certified cashier's check, or bidder's bond executed by an admitted surety, made payable to City. The bid security shall be an amount equal to ten percent (10%) of the total annual bid amount included with their proposals as required by California law.

*Note:* All bids must be accompanied by a scanned copy of the bid security uploaded to PlanetBids. The original security of the three (3) lowest bidders must also be mailed or submitted to the office of the City Clerk at 130 Cremona Drive, Suite B, Goleta, California 93117, in a sealed envelope and be received or postmarked within three (3) City business days after the bid due date and time; otherwise, the bid shall be considered non-responsive. The sealed envelope should be plainly marked on the outside, **"SEALED BID SECURITY FOR GOLETA VALLEY LIBRARY PROJECT NO. 9130"**.

**Performance Security**

Pursuant to Public Contract Code section 22300, the successful bidder may substitute certain securities for funds withheld by CITY to ensure performance under the Contract or, in the alternative, request the City to make payment of retention to an escrow agent.

**Affirmative Action**

The Project is subject to compliance monitoring and enforcement by the Department of Industrial Relations (DIR) per California Labor Code Section 1771.4, including prevailing wage rates and apprenticeship employment standards. Affirmative action to ensure against discrimination in employment practices on the basis of race, color, national origin, ancestry, sex, or religion will also be required. The City hereby affirmatively ensures that all business enterprises will be afforded full opportunity to submit bids in response to this notice and will not be discriminated against on the basis of race, color, national origin, ancestry, sex, or religion in any consideration leading to the award of contract.

**Department of Industrial Relations (DIR)**

Pursuant to Labor Code sections 1725.5 and 1771.1, all contractors and subcontractors that wish to bid on, be listed in a bid proposal, or enter into a contract to perform public work must be registered with the DIR. No Bid will be accepted, nor any contract entered into without proof of the contractor's and subcontractors' current registration with the DIR to perform public work. If awarded a contract, the Bidder and its subcontractors, of any tier, shall maintain active registration with the DIR for the duration of the Project. Failure to provide proof of the contractor's current registration pursuant to Labor Code Section 1725.5 may result in rejection of the bid as non-responsive.



**SECTION 00 11 13  
NOTICE INVITING BIDS**

**DIVISION 00**

**Contractor License**

A contract may only be awarded to the lowest responsive and responsible bidder properly licensed in accordance with the laws of the State and the City of Goleta. Contractor shall possess a valid Class B - General Building Contractor license prior to award of Contract. Said license shall be maintained during the contract period. It is the Bidder's and Contractor's responsibility to obtain the correct Contractor's licenses. Bidders shall be skilled and regularly engage in the general class or type of work called for under this contract.

**Performance and Payment Bonds**

The successful Bidder will be required to furnish a Performance Bond and a Payment Bond each in an amount equal to 100% of the Contract Price. Each bond shall be in the forms set forth herein, shall be secured from a surety company that meets all State of California bonding requirements, as defined in Code of Civil Procedure Section 995.120, and that is a California admitted surety insurer.

**Prevailing Rate of Wages**

Pursuant to California Labor Code Section 1773, the City has ascertained the General Prevailing Rate of Wages in the County in which the work is to be done to be as determined by the Director of Industrial Relations of the State of California. Contractor is hereby made aware that information regarding prevailing wage rates may be obtained from the State Department of Industrial Relations and/or the following website address: <https://www.dir.ca.gov/oprl/dprevwagedetermination.htm>. The Contractor is required to post a copy of the applicable wage rates at the job site. Attention is directed to Section 7 "Legal Relations and Responsibility to the Public" of the Standard Construction Specifications.

**Contractor Experience**

The Contractor Company, including the Responsible Managing Officer (RMO) for the Contractor Company, shall demonstrate a minimum of ten (10) years' experience successfully performing projects of substantially similar type, magnitude, and character of the work bid.

**Rejection of Bids**

The City reserves the right to reject all bids, reject any bid that is not responsive to the invitation, or to waive any minor irregularity and to take all bids under advisement for a period of up one hundred and twenty (120) calendar days. Failure to provide proof of the Contractor's current registration pursuant to Section 1725.5 of the Labor Code may result in rejection of the bid as non-responsive. Failure to comply with enforcement provisions pursuant to Section 1771.4 of the Labor Code may result in a determination that the Bidder is not responsible.

**Liquidated Damages**

The Liquidated Damages shall be \$3,000 per day.

**Protest**

Any protest to an intended award of this contract shall be made in writing addressed to the City Clerk according to Specification Section 002113, Paragraph 5.25 (Filing of Bid Protests) and filed and received by the City not more than five (5) calendar days following the date of City's Notice of Intent to Award the Contract. Any protest may be considered and acted on by the City Council at the time noticed for award of the contract. To request a copy of the notice of agenda for award, please contact the City Clerk (805) 961-7505 or register on the City's website ([www.cityofgoleta.org](http://www.cityofgoleta.org)).

All questions about this project and bidding requirements must be submitted in writing through PlanetBids.

Posted: October 14, 2025

Publication Date: Santa Barbara Independent, October 16, 2025

**END OF NOTICE INVITING BIDS**



**SECTION 00 21 13  
INSTRUCTIONS TO BIDDERS**

**SUMMARY**

**1.01 DOCUMENT INCLUDES**

- A. Invitation
  - 1. Questions
  - 2. Mandatory Pre-Bid Meeting
- B. Bid Documents and Contract Documents
  - 1. Securing Documents
  - 2. Examination of Site and Contract Documents
  - 3. Interpretation of Drawings and Documents
  - 4. Product Substitutions
  - 5. Addenda
  - 6. Alternate Bids
- C. Qualifications
  - 1. Subcontractors
  - 2. Licensing Requirements
- D. Bid Submission/Enclosures/Requirements
  - 1. Completion of Bid Forms
  - 2. Bid Delivery and Modifications of Bids
  - 3. Bid Guarantee (Bond)
  - 4. Iran Contracting Act of 2010
  - 5. Compliance with Economic Sanctions in Response to Russia's Actions in Ukraine
  - 6. Noncollusion Declaration
  - 7. Public Works Contractor Registration Certification
  - 8. Fleet Compliance Certification
  - 9. Certificate of Asbestos and Lead-Based Paint (New Work)
  - 10. Bidder Information and Experience Form
  - 11. Workers' Compensation Certification
  - 12. Signing of Bids
  - 13. Submission of Sealed Bids
  - 14. Opening of Bids
  - 15. Withdrawal of Bid
  - 16. Submission of Cost Breakdown by Apparent Low Bidders
  - 17. Bidders Interested in More Than One Bid
  - 18. Substitution of Security
  - 19. Debarment of Contractors and Subcontractors
  - 20. Insurance Requirements
  - 21. Performance Bond and Payment Bond Requirements
  - 22. Sales and Other Applicable Taxes, Permits, Licenses, and Fees
  - 23. Permit Fee Allowance
  - 24. Filing of Bid Protests
  - 25. Basis of Award, Balanced Bid
  - 26. Award Process
  - 27. Execution of Contract



**SECTION 00 21 13  
INSTRUCTIONS TO BIDDERS**

**DIVISION 00**

**1.02 RELATED DOCUMENTS**

- A. Document 00 11 13 - Notice Inviting Bids
- B. Document 00 41 00 - Bid Form
- C. Document 00 43 13 - Bid Bond
- D. Document 00 43 36 - Proposed Subcontractors Form
- E. Document 00 43 25 - Substitution Request Form - During Procurement
- F. Document 00 43 27 - Summary of Cost and Bid Breakdown.
- G. Document 00 73 00 - Special Conditions
- H. Document 00 45 13 - Bidder's Qualifications
- I. Document 00 45 46 - Governmental Certifications

**INVITATION**

**2.01 QUESTIONS**

- A. Questions regarding this Notice Inviting Bids must be submitted via electronic transmission on the City of Goleta PlanetBids portal site by **5:00 P.M. (PST) on Tuesday, November 4, 2025.** No other members of the City's staff or governing body should be contacted about this procurement during the bidding process. Any and all inquiries and comments regarding this Bid must be communicated in writing, unless otherwise instructed by the City. The City may, in its sole discretion, disqualify any Bidder who engages in any prohibited communications.

**2.02 MANDATORY PRE-BID MEETING**

- A. Mandatory pre-bid meetings will be held at the Project Site (500 North Fairview Avenue, Goleta, California, 93117) at:
  - 1. **Thursday, October 23, 2025, at 2:00 P.M. (PST)**
  - 2. **Tuesday, October 28, 2025, at 2:00 P.M. (PST)**
- B. Attendance at one meeting is required. Bidders must attend a pre-bid meeting, fully inspect the Project Site, and will be held responsible for all information presented. It is required that the Bidders become thoroughly familiar with the terms and conditions of the Bid Plans, Special Provisions, and Local Conditions affecting the performance and costs of the Work prior to bidding and it is recommended that this be done prior to attending the pre-bid meeting.

**BID DOCUMENTS AND CONTRACT DOCUMENTS**

**3.01 SECURING DOCUMENTS**

- A. Bids must be submitted to the City on the Bid Forms, which are a part of the Bid Package for the Project. The proposal forms, bid security, and all other documents required to be submitted with the bid must be submitted via electronic transmission on the City of Goleta PlanetBids portal site. Bid and Contract Documents may be obtained from PlanetBids in the Notice Inviting Bids.
- B. **Bidders must be registered on the City of Goleta's PlanetBids portal in order to access bid documents, receive addendum notifications, and to submit a bid. Visit PlanetBids for bid results and award information.** It is the responsibility of the bidder to submit the bid with sufficient time to be received by PlanetBids prior to the bid opening date and time. Allow time for technical difficulties, uploading, and unexpected delays. **Late or incomplete bids will not be accepted.**
- C. Failure to acknowledge addenda on the Bid Form may make a bid nonresponsive and not eligible for award of the contract.



**SECTION 00 21 13  
INSTRUCTIONS TO BIDDERS**

**DIVISION 00**

**3.02 EXAMINATION OF SITE AND CONTRACT DOCUMENTS**

- A. At its own expense and prior to submitting its Bid, each Bidder shall visit the site of the proposed work and fully acquaint itself with the conditions relating to the construction and labor required so that the Bidder may fully understand the work, including but not limited to difficulties and restrictions attending the execution of the work under the contract. Site examination shall occur during the scheduled pre-bid meetings. Each Bidder shall carefully examine the Drawings, and shall read the Specifications, Contract, and all other documents referenced herein. Each Bidder shall also determine the local conditions which may in any way affect the performance of the work, including local tax structure, contractors' licensing requirements, availability of required insurance, the prevailing wages and other relevant cost factors, shall familiarize itself with all federal, state and local laws, ordinances, rules, regulations and codes affecting the performance of the work, including the cost of permits and licenses required for the work, and shall make such surveys and investigations, including investigations of subsurface or latent physical conditions at the site or where work is to be performed as may be required. Bidders are responsible for consulting the standards referenced in the Contract. The failure or omission of any Bidder to receive or examine any contract documents, forms, instruments, addenda, or other documents, or to visit the site and acquaint itself with conditions there existing shall in no way relieve any Bidder from any obligation with respect to its Bid or to the contract and no relief for error or omission will be given except as required under State law. The submission of a Bid shall be taken as conclusive evidence of compliance with this Article.

**3.03 INTERPRETATION OF DRAWINGS AND DOCUMENTS**

- A. Prospective Bidders unclear as to the true meaning of any part of the Drawings, Specifications or other proposed contract documents may submit to the City a written request for interpretation through PlanetBids. The prospective Bidder submitting the request is responsible for prompt delivery. Interpretation of the Drawings, Specifications, or other proposed contract documents will be made only by a written addendum duly issued through PlanetBids. The City will not be responsible for any other explanation or interpretations of the proposed documents. If a Prospective Bidder becomes aware of any errors or omissions in any part of the Contract Documents, it is the obligation of the Prospective Bidder to promptly bring it to the attention of the City through PlanetBids.
- B. Before submitting its bid, bidder will carefully study and compare the various documents comprising the Contract Documents and compare them with any other work being bid concurrently or presently under construction which relates to the Work for which the bid is submitted; will examine the project site, the conditions under which the Work is to be performed, and the local conditions; and will at once report to the City's representative errors, inconsistencies, or ambiguities discovered. The drawings and specifications contained in these Contract Documents do not constitute a representation or warranty that any conditions shown therein actually exist.
- C. Clarifications, interpretations, corrections, and changes to the Contract Documents will only be made by addenda. Purported clarifications, interpretations, corrections, and changes to the Contract Documents made in any other manner will not be binding and bidders will not rely upon them.



## **SECTION 00 21 13 INSTRUCTIONS TO BIDDERS**

**DIVISION 00**

### **3.04 PRODUCT SUBSTITUTIONS**

- A. Requests for product substitutions will be considered during the bidding process. All requests shall be submitted through a Bid RFI process (electronically through PlanetBids Question and Answer tab), so that all bidders will be informed. All requests must be submitted by the Question Deadline timeframe specified in 00 21 13 Section 2.01(A). Bidders wishing to obtain authorization for an or equal substitution of an equivalent material, product or equipment, shall submit all requests for or equal substitution using the form included as 00 43 25 - Substitution Request Form - During Procurement, together with data substantiating Bidder's representation that the non-specified item is of equal quality to the item, in accordance with 01 25 13 - Product Procedures For Substitution And "Or Equal". Requests for product substitutions not handled through the Bid RFI process will not be considered. Authorization of an equal substitution of equivalent materials is solely within the discretion of the City and, if given, shall be made by Addendum issued by the City before Bid Opening. Bids shall not be based on any or equal substitution request that has not been authorized in writing by Addendum. In the absence of a written Addendum authorizing a pre-Bid or equal substitution request, the request shall be deemed denied.

### **3.05 ADDENDA**

- A. The City reserves the right to revise the Contract Documents prior to the Bid opening date. Revisions, if any, shall be made by written Addenda. All Addenda issued by the City shall be included in the Bid and made part of the Contract Documents. Pursuant to Public Contract Code Section 4104.5, if the City issues an Addendum which includes material changes to the Project less than 72 hours prior to the deadline for submission of Bids, the City will extend the deadline for submission of Bids. The City may determine, in its sole discretion, whether an Addendum warrants postponement of the Bid submission date. Bidders must be registered on the City's PlanetBids portal to receive addendum notifications. Addenda will be posted on PlanetBids portal. The Bidder shall indicate the Addenda received prior to bidding in the space provided in the Bid Form. Failure to indicate all Addenda received may be sufficient cause for rejecting the Bid.

### **3.06 ALTERNATE BIDS**

- A. If alternate bid items are called for in the Contract Documents, the time required for completion of the alternate bid items has already been factored into the Contract duration and no additional Contract time will be awarded for any of the alternate bid items. The City may elect to include one or more of the alternate bid items, or to otherwise remove certain work from the Project scope of work. Accordingly, each bidder must ensure that each bid item contains a proportionate share of profit, overhead, and other costs or expenses which will be incurred by the bidder.

## **QUALIFICATIONS**

### **4.01 SUBCONTRACTORS**

- A. Bidder shall set forth the name, address of the place of business, and contractor license number of each subcontractor who will perform work, labor, furnish materials or render services to the bidder on said contract and each subcontractor licensed by the State of California who, under subcontract to bidder, specially fabricates and installs a portion of the Work described in the Drawings and Specifications in an amount in excess of one half of one percent (0.5%) of the total bid price, and shall indicate the portion of the work to be done by such subcontractor in accordance with Public Contract Code Section 4104. Substitution of subcontractors after the bid deadline who are listed in the proposal form will only be allowed with the City's written consent and in accordance with California law.





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**4.02 LICENSING REQUIREMENTS**

- A. Pursuant to Business and Professions Code Section 7028.15 and Public Contract Code Section 3300, all bidders must possess proper licenses for performance of this Contract. Subcontractors must possess the appropriate licenses for each specialty subcontracted. Pursuant to Business and Professions Code Section 7028.5, the City shall consider any bid submitted by a contractor not currently licensed in accordance with state law and pursuant to the requirements found in the Contract Documents to be nonresponsive, and the City shall reject the Bid. The City shall have the right to request, and Bidders shall provide within ten (10) calendar days, evidence satisfactory to the City of all valid license(s) currently held by that Bidder and each of the Bidder's subcontractors, before awarding the Contract.
- B. Prime contractor shall hold an active Class B – General Building Contractor license at bid and award. Subcontractors shall hold appropriate specialty licenses for their trades.

**BID SUBMISSION/ENCLOSURES/REQUIREMENTS**

**5.01 COMPLETION OF BID FORMS**

- A. Bids will be submitted on the proposal forms included with the Contract Documents. Bids not submitted on the City's proposal forms will be rejected. All blanks on the proposal forms will be filled in legibly. Bidder's failure to submit a price for any alternate or unit price will result in the bid being considered as non-responsive. If alternates are called for and no change in the lump sum base bid is required, enter "no change."
- B. Bidder will make no stipulations on the proposal forms nor qualify the bid in any manner. The bids will be based upon full completion of all the Work as shown on the plans and specifications. It is expressly understood that the plans are drawn with as much accuracy as is possible in advance, but should errors, omissions or discrepancies exist in the plans which show conditions that vary from those encountered in construction, the bidder (if awarded the contract) specifically agrees to construct a completed Work ready for the use and in the manner which is intended.
- C. Bidder is aware of and, if awarded the contract, will comply with legal requirements in its performance of the Work and is required to pay City business license fee(s).
- D. Bidder shall not damage or endanger and shall preserve and protect adjacent properties.
- E. Bidder has familiarized itself with the staging and material storage constraints of the Project site and surrounding buildings and will confine its staging and storage operations to approved areas.
- F. Bidder will coordinate its construction activities with the other contractors and utility companies performing work on the Project site, if any, including, but not limited to, any separate contractor retained by the City.
- G. Refer to the Bid Form for specifics. Bid Forms must include all required supplements and attachments, as specified.

**5.02 BID DELIVERY AND MODIFICATIONS OF BIDS**

- A. The proposal forms, bid security, and all other documents required to be submitted with the bid must be submitted via electronic transmission on the City of Goleta PlanetBids portal site. Bidders must be registered on the City of Goleta's PlanetBids portal in order to submit a bid. Go to PlanetBids for bid results and awards. It is the responsibility of the bidder to submit the bid with sufficient time to be received by PlanetBids prior to the bid opening date and time. Allow time for technical difficulties, uploading, and unexpected delays. Late or incomplete bids will not be accepted.



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- B. Each Bidder shall submit its Bid in strict conformity with the requirements of the Contract Documents. Unauthorized additions, modifications, revisions, conditions, limitations, exclusions or provisions attached to a Bid may render it non-responsive and may cause its rejection. Bidders shall not delete, modify, or supplement the printed matter on the Bid Forms, or make substitutions thereon. Oral, telephonic and electronic modifications will not be considered.
- C. Bids may not be modified, withdrawn, or canceled within one hundred twenty (120) calendar days after the bid deadline unless otherwise provided in any supplementary instructions to bidders. If a Bidder withdraws, cancels or modifies its bid within the time specified above, the bidder shall be prohibited from further bidding on the project and the bid bond shall be forfeited. The City, at its discretion, may award the bid to the next responsive and responsible bidder. In the event the next bidder refuses to enter into the contract, that bidder's bid bond shall then be forfeited.

**5.03 BID GUARANTEE (BOND)**

- A. Each bid must be accompanied by bid security, in the amount of 10% of the Total Base Bid on the base Contract Work, excluding any Alternate Bid Items, as security for bidder's obligation to enter into a contract with the City on the terms stated in the proposal forms and to furnish all items required by the Contract Documents.
- B. All bids must be accompanied by a scanned copy of the bid security uploaded to PlanetBids. The original security of the three (3) apparent lowest bidders must be mailed to the office of the City Clerk at 130 Cremona Drive, Suite B, Goleta, California 93117, in a sealed envelope and be received within three (3) city business days after bid due date and time; otherwise, the bid will be considered non-responsive. The sealed envelope should be plainly marked on the outside identifying the names as shown in the notice inviting sealed bids.
- C. If the apparent lowest responsible bidder fails to sign the contract and furnish all items required by the bidding documents within the time limits specified in these bidding instructions, the City may reject such bidder and select the next apparent lowest responsible bidder until all bids have been exhausted or the City may reject all bids. In the event the bid is rejected, such bidder will be liable for and forfeit to the City the amount of the difference, not to exceed the amount of the bid security, between the amount of the disqualified bid and the larger amount for which the City procures the Work. The City may also use the bid security to cover the cost of rebidding the project.
- D. If a bid bond is submitted and an attorney-in-fact executes the bid bond on behalf of the surety, a notarized and current copy of the power of attorney will be affixed to the bid bond. The surety issuing the bid bond must be admitted to provide surety within the State of California.
- E. The City will retain the bid security until the occurrence of one of the following:
  - 1. All items required by the bidding documents have been furnished and the contract has been signed by the successful bidder and the City.
  - 2. The specified time has elapsed during which bids may be withdrawn.
  - 3. All bids have been rejected.





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**5.04 IRAN CONTRACTING ACT OF 2010**

- A. In accordance with Public Contract Code Section 2200 et seq., the City requires that any person that submits a bid or proposal or otherwise proposes to enter into or renew a contract with the City with respect to goods or services of one million dollars (\$1,000,000) or more, certify at the time the bid is submitted or the contract is renewed, that the person is not identified on a list created pursuant to subdivision (b) of Public Contract Code Section 2203 as a person engaging in investment activities in Iran described in subdivision (a) of Public Contract Code Section 2202.5, or as a person described in subdivision (b) of Public Contract Code Section 2202.5, as applicable.
- B. The form of such Iran Contracting Certificate is included with the bid package and must be signed and dated under penalty of perjury.

**5.05 COMPLIANCE WITH ECONOMIC SANCTIONS IN RESPONSE TO RUSSIA'S ACTIONS IN UKRAINE**

- A. Per Executive Order N-6-22, all contractors and grantees that have agreements valued at \$5 million or more with agencies/departments subject to the California Governor's authority are directed to report to their contracting or grantor agency or department regarding their compliance with economic sanctions imposed by the U.S. government in response to Russia's actions in Ukraine, as well as sanctions imposed under state law, if any.
- B. The form of compliance is included with the bid package and must be signed and dated under penalty of perjury.

**5.06 NONCOLLUSION DECLARATION**

- A. Bidders on all public works contracts are required to submit a declaration of non-collusion with their bid. This form is included with the bid package and must be signed and dated under penalty of perjury.

**5.07 PUBLIC WORKS CONTRACTOR REGISTRATION CERTIFICATION**

- A. Pursuant to Labor Code sections 1725.5 and 1771.1, all contractors and subcontractors that wish to bid on, be listed in a bid proposal, or enter into a contract to perform public work must be registered with the Department of Industrial Relations. No bid will be accepted nor any contract entered into without proof of the contractor's and subcontractors' current registration with the Department of Industrial Relations to perform public work. If awarded a contract, the bidder and its subcontractors, of any tier, shall maintain active registration with the Department of Industrial Relations for the duration of the Project. To this end, Bidder shall sign and submit with its Bid the Public Works Contractor Registration Certification on the form provided, attesting to the facts contained therein. Failure to submit this form may render the bid non-responsive. In addition, each Bidder shall provide the registration number for each listed subcontractor in the space provided in the Designation of Subcontractors form.

**5.08 FLEET COMPLIANCE CERTIFICATION**

- A. Bidders must certify compliance with the California Air Resources Board (CARB) Regulation set forth in Title 13, California Code of Regulations, Division 3, Chapter 9, effective January 1, 2024. Under penalty of perjury, each bidder shall declare whether their fleet, and that of any subcontractors, is subject to the Regulation and provide a Certificate of Reported Compliance, qualifies for an exemption under section 2449.1(f)(2) with supporting documentation, is unable to procure R99 or R100 renewable diesel fuel under section 2449.1(f)(3) with records of attempts to procure, qualifies for an emergency exemption under section 2449(i)(4) with vehicle records maintained, or is otherwise not subject to the Regulation with a detailed explanation.



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**5.09 CERTIFICATE OF ASBESTOS AND LEAD-BASED PAINT (NEW WORK)**

- A. Bidders must certify that no asbestos-containing material in excess of 1 percent as defined by applicable US Environmental Protection Agency regulations, and no lead-based paint has been furnished or installed at the referenced project.

**5.10 BIDDER INFORMATION AND EXPERIENCE FORM**

- A. Each Bidder shall complete the questionnaire provided herein and shall submit the questionnaire along with its Bid. Failure to provide all information requested within the questionnaire along with the Bid may cause the bid to be rejected as non-responsive. The City reserves the right to reject any Bid if an investigation of the information submitted does not satisfy the City that the Bidder is qualified to properly carry out the terms of the contract.

**5.11 WORKERS' COMPENSATION CERTIFICATION**

- A. In accordance with the provisions of Labor Code Section 3700, Contractor shall secure the payment of compensation to its employees. Contractor shall sign and file with the City the following certificate prior to performing the work under this Contract:  

I am 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 I will comply with such provisions before commencing the performance of the work of this contract.
- B. The form of such Workers' Compensation Certificate is included as part of this document.

**5.12 SIGNING OF BIDS**

- A. All Bids submitted shall be executed by the Bidder or its authorized representative. Bidders may be asked to provide evidence in the form of an authenticated resolution of their Board of Directors or a Power of Attorney evidencing the capacity of the person signing the Bid to bind the Bidder to each Bid and to any Contract arising therefrom.
- B. If a Bidder is a joint venture or partnership, it may be asked to submit an authenticated Power of Attorney executed by each joint venturer or partner appointing and designating one of the joint venturers or partners as a management sponsor to execute the Bid on behalf of Bidder. Only that joint venturer or partner shall execute the Bid. The Power of Attorney shall also: (1) authorize that particular joint venturer or partner to act for and bind Bidder in all matters relating to the Bid; and (2) provide that each venturer or partner shall be jointly and severally liable for any and all of the duties and obligations of Bidder assumed under the Bid and under any Contract arising therefrom. The Bid shall be executed by the designated joint venturer or partner on behalf of the joint venture or partnership in its legal name.

**5.13 SUBMISSION OF SEALED BIDS**

- A. Once the Bid and supporting documents have been completed and signed as set forth herein, they shall be submitted, along with the Bid Guarantee and other required materials via electronic transmission on the City of Goleta PlanetBids portal site, which can be accessed at the City website, and will be publicly opened and posted promptly thereafter. Bids received after the time and day set for the receipt of bids shall not be accepted.

**5.14 OPENING OF BIDS**

- A. At the time and place set for the opening and reading of bids, or any time thereafter, each and every bid received prior to the time and day set for the receipt of bids will be publicly opened and posted promptly thereafter. The City will not accept any Bid received after the specified date and time. It is the bidder's sole responsibility to ensure that its Bid is received as specified. Bids may be submitted earlier than the date(s) and time(s) indicated.



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- B. The public bid result will include the following information:
  - 1. The name and business location of the bidder.
  - 2. The nature and amount of the bid security furnished by bidder.
  - 3. The bid amount.
- C. A responsive Bid is a Bid that conforms, in all material respects, to these Instructions to Bidders. Non-responsive Bids will be rejected.
- D. A responsible bidder means a bidder who has demonstrated the attributes of trustworthiness, quality, fitness, capacity, and experience to satisfactorily perform fully the requirements of the Contract.
- E. In addition to other provisions of the Bidding Documents, upon the request of the City, a bidder whose Bid is under consideration for the award of the Contract shall promptly submit satisfactory evidence to City showing the bidder's financial resources, experience in the field, and organization and other factors evidencing bidder's ability to successfully execute and complete the Contract.
- F. The City reserves the right to reject any or all bids and to waive discrepancies, irregularities, informalities, or any other error in the bid or bidding, when to do so seems to best serve the public interest. The right of the City to waive errors applies even if the Bidding Documents state that a discrepancy, irregularity, informality, or other error make a bid nonresponsive, so long as the error does not constitute a material error. The City reserves the right, in its sole discretion, to: judge the bidder's representations as stated in the proposal forms and any post-Bid information to determine whether or not bidder is qualified to perform the Work; be the sole judge regarding the suitability of the products, services, or supplies offered; to not purchase all items or the full quantity of each item listed in the Bid Item List; reject any or all Bids; waive any deficiencies, irregularities, or informalities in any Bids or in the bidding process; modify, cancel, or withdraw the Notice Inviting Sealed Bids; issue a new Notice Inviting Sealed Bids; suspend or abandon the Project; seek the assistance of outside technical experts in Bid evaluation; require a bidder to provide a guarantee (or guarantees) of the Contract by a third party; and not issue a Notice to Proceed after execution of the Contract. In submitting a Bid in response to the Notice Inviting Sealed Bids, the bidder is specifically acknowledging the City holds these rights. The Notice Inviting Sealed Bids does not commit the City to enter into a Contract, to reject, in its sole discretion, all Bids, nor does it obligate the City pay for any costs incurred by bidders in preparation and submission of a Bid or in anticipation of a Contract. By submitting a Bid, the bidder disclaims any right to be paid for such costs.
- G. The City may reject any bid not accompanied by the required bid security or any other item required by the bidding documents, or a bid which is in any other way materially incomplete, irregular or not responsive to the bid request in the sole determination of the City

**5.15 SUBMISSION OF COST BREAKDOWN BY APPARENT LOW BIDDERS**

- A. Within three (3) business days after bid opening, the three (3) apparent lowest bidders shall submit to the City the completed Cost Breakdown Form (Section 00 43 27).
- B. The form shall be itemized by CSI Division (or as otherwise directed in the Bid Documents) and shall reconcile to the total lump sum bid.
- C. Failure to submit the required Cost Breakdown Form within the time specified may render the bid nonresponsive and eliminate the bidder from further consideration.



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**5.16 WITHDRAWAL OF BID**

- A. Any bid may be withdrawn either personally or by written request, incurring no penalty, at any time prior to the scheduled closing time for receipt of bids. Requests to withdraw bids shall be worded so as not to reveal the amount of the original bid. Withdrawn bids may be resubmitted until the time and day set for the receipt of bids, provided that resubmitted bids are in conformance with the instructions herein.
- B. Bids may not be modified, withdrawn, or canceled within one hundred twenty (120) days after the bid deadline unless otherwise provided in any supplementary instructions to bidders. If a bidder withdraws, cancels or modifies its bid within the time specified above, the bidder shall be prohibited from further bidding on the project and the bid bond shall be forfeited. The City, at its discretion, may award the bid to the next responsive and responsible bidder. In the event the next bidder refuses to enter into the contract, that bidder's bid bond shall then be forfeited.
- C. Bids may be withdrawn after bid opening only by providing written notice to City within five (5) working days of the bid opening and in compliance with Public Contract Code Section 5100 et seq., or as otherwise may be allowed with the consent of the City.

**5.17 BIDDERS INTERESTED IN MORE THAN ONE BID**

- A. No Bidder shall be allowed to make, file or be interested in more than one bid for the same work unless alternate bids are specifically called for. A person, firm or corporation that has submitted a sub-proposal to a Bidder, or that has quoted prices of materials to a Bidder, is not thereby disqualified from submitting a sub-proposal or quoting prices to other bidders. No person, firm, corporation, or other entity may submit a sub-proposal to a Bidder, or quote prices of materials to a Bidder, when also submitting a prime Bid on the same Project.

**5.18 SUBSTITUTION OF SECURITY**

- A. The Contract Documents call for monthly progress payments based upon the percentage of the Work completed. The City will retain a percentage of each progress payment as provided by the Contract Documents. At the request and expense of the successful Bidder, the City will substitute securities for the amount so retained in accordance with Public Contract Code Section 22300.

**5.19 PREVAILING WAGES**

- A. The City has obtained from the Director of the Department of Industrial Relations the general prevailing rate of per diem wages in the locality in which this work is to be performed for each craft or type of worker needed to execute the Contract. These rates are available at the Engineering Division of the City or may be obtained online at <http://www.dir.ca.gov>. Bidders are advised that a copy of these rates must be posted by the successful Bidder at the job site(s).

**5.20 DEBARMENT OF CONTRACTORS AND SUBCONTRACTORS**

- A. In accordance with the provisions of the Labor Code, contractors or subcontractors may not perform work on a public works project with a subcontractor who is ineligible to perform work on a public project pursuant to Labor Code Sections 1777.1 or 1777.7. 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. Any public money that is paid to a debarred subcontractor by the Contractor for the Project shall be returned to the City. 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.



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**5.21 INSURANCE REQUIREMENTS**

- A. Prior to commencing work, the successful bidder shall purchase and maintain insurance as set forth in the General Conditions.

**5.22 PERFORMANCE BOND AND PAYMENT BOND REQUIREMENTS**

- A. The successful bidder will be required to furnish a Labor and Material Payment Bond and a Faithful Performance Bond each in an amount equal to one hundred percent (100%) of the contract price. Each bond shall be secured from a surety company that meets all State of California bonding requirements, as defined in California Code of Civil Procedure Section 995.120 and is admitted by the State of California. Each bond shall be accompanied, upon the request of City, with all documents required by California Code of Civil Procedure Section 995.660 to the extent required by law. All bonding and insurance requirements shall be completed and submitted to City within ten (10) working days from the date the City provides the successful bidder with the Notice of Intent to Award.

**5.23 SALES AND OTHER APPLICABLE TAXES, PERMITS, LICENSES AND FEES**

- A. Contractor and its subcontractors performing work under this Contract will be required to pay California sales tax and other applicable taxes, and to pay for permits, licenses and fees required by the agencies with authority in the jurisdiction in which the Work will be located, unless otherwise expressly provided by the Contract Documents.

**5.24 ALLOWANCES**

- A. Bidder shall include in the Base Bid the allowances specified in Division 01 Section 012100. Allowances shall be incorporated into the Bid Proposal, the Proposed Schedule of Values, and subsequent Applications for Payment. Failure to carry allowances may render the Bid non-responsive.

**5.25 FILING OF BID PROTESTS**

- A. Any registered Bidder may file a protest provided that each and all of the following are complied with:
  - 1. The bid protest is in writing;
  - 2. Protests based upon alleged defects or improprieties in the Bidding Documents are filed with the City prior to the Bid Deadline;
  - 3. All other protests are filed and received by the City not more than five (5) calendar days following the date of City's Notice of Intent to Award the Contract; and
  - 4. The written bid protest sets forth, in detail, all grounds for the bid protest, including without limitation all facts, supporting documentation, legal authorities and argument in support of the grounds for the bid protest. All factual contentions must be supported by competent, admissible and credible evidence.
- B. Any matters not set forth in the written bid protest shall be deemed waived. Any bid protest not conforming to the foregoing shall be rejected by the City as invalid.

**AWARD PROCESS**

**6.01 BASIS OF AWARD; BALANCED BID**

- A. The City shall award the Contract to the lowest responsible Bidder submitting a responsive Bid. The lowest Bid will be determined on the basis of the Base Bid Price.
- B. The City may reject any Bid which, in its opinion when compared to other Bids received or to the City's internal estimates, does not accurately reflect the cost to perform the Work. The City may reject as non-responsive any Bid which unevenly weights or allocates costs, including but not limited to overhead and profit to one or more particular bid items.



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**6.02 AWARD PROCESS**

- A. The City may retain all bids for a period of one hundred twenty (120) days for examination and comparison, and to delete any portion of the Work from the contract.
- B. The City may waive nonmaterial irregularities in a bid and will accept the lowest responsive bid from a responsible bidder as determined by the City.
- C. The City will determine the low bidder on the basis of the total base bid price in words on the bidding sheet as described on the bidding sheet.
- D. City Staff will identify the apparent lowest responsive and responsible bidder and notify such bidder within one hundred and twenty (120) calendar days (unless the number of days is modified in any Addendum issued to bidders) after the Bid Deadline. Within fifteen (15) days after receiving the City's written notice that bidder was identified as the apparent lowest responsible bidder, bidder will submit to the City all of the following items as required by the City:
  - 1. One original of the payment bond.
  - 2. One original of the performance bond.
  - 3. Certificates of insurance and additional insured endorsements on forms provided by the city.
  - 4. Copy of current City of Goleta business license certificate.
  - 5. Names of all subcontractors, with their DIR registration number, license numbers, addresses, telephone number, facsimile number and trade on bidders' company stationery. Evidence, as required by the city, of the reliability and responsibility of the proposed subcontractors such as statements of experience, statements of financial condition, and references.
- E. A contractor or subcontractor shall not be qualified 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, as defined in this chapter, unless currently registered and qualified to perform public work pursuant to Section 1725.5. It is not a violation of this section for an unregistered contractor to submit a bid that is authorized by Section 7029.1 of the Business and Professions Code or by Section 10164 or 20103.5 of the Public Contract Code, provided the contractor is registered to perform public work pursuant to Section 1725.5 at the time the contract is awarded. This Project is subject to compliance monitoring and enforcement by the California Department of Industrial Relations.
- F. If bidder submits all items required within fifteen (15) days after receiving the City's notification, and all such items comply with the requirements of the bidding documents, the City will submit the bid to the City Council for award of Contract. Following City Council Award of Contract, the City will sign the contract and return a signed copy of the contract to bidder.

**6.03 EXECUTION OF CONTRACT**

- A. As required herein the Bidder to whom an award is made shall execute the Contract in the amount determined by the Contract Documents. The City may require appropriate evidence that the persons executing the Contract are duly empowered to do so. The Contract and bond forms to be executed by the successful Bidder are included within these Specifications and shall not be detached.

**END OF SECTION**



**DIVISION 00**

**SECTION 00 31 00  
AVAILABLE PROJECT INFORMATION**

**PART 1 GENERAL**

**1.01 EXISTING CONDITIONS**

- A. Certain information relating to existing surface and subsurface conditions and structures is available to bidders but will not be part of Contract Documents, as follows:
- B. Site and Utility Survey: Entitled Design Survey, dated August 29, 2024.
- C. Hazardous Material Survey: Entitled Limited Asbestos and Lead Assessment Survey, dated January 3, 2025.
- D. Hazardous Material Survey: Entitled Limited Asbestos and Lead Assessment Survey, dated October 4, 2025.
- E. Fire Hydrant Flow Form: Entitled Goleta Water District Fire Hydrant Flow Form, dated October 30, 2024.
- F. Goleta Valley Public Library As-Builts (For Reference Only): Entitled Goleta Valley Public Library, dated October 1, 1971.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION - NOT USED**

**END OF SECTION**





SECTION 00 41 00  
BID FORM

DIVISION 00

TO: CITY OF GOLETA (OWNER)  
130 CREMONA DRIVE, SUITE B  
GOLETA, CALIFORNIA 93117

FOR: GOLETA VALLEY LIBRARY ADA, SAFETY, AND BUILDING IMPROVEMENT PROJECT  
(CIP 9130)

DATE: \_\_\_\_\_  
(Bidder to enter date)

SUBMITTED BY: \_\_\_\_\_  
(Bidder to enter name)

Bidder's Full Name \_\_\_\_\_

Address \_\_\_\_\_

City, State, Zip \_\_\_\_\_

Bids will be received via electronic transmission on the City of Goleta PlanetBids portal site until the time specified in the Invitation to Bid.

The undersigned hereby declare that we have carefully examined the location of the proposed Work, and have read and examined the Contract Documents, including all plans, specifications, and addenda, if any, for the Project.

We hereby propose to furnish all labor, materials, equipment, tools, transportation, and services, and to discharge all duties and obligations necessary and required to perform and complete the Project, as described and in strict conformity with the Drawings, and these Specifications for the **TOTAL BID PRICE** indicated herein.

The undersigned acknowledges receipt, understanding, and full consideration of the following addenda to the Contract Documents:

1. Addendum # \_\_\_\_\_ Dated \_\_\_\_\_.
2. Addendum # \_\_\_\_\_ Dated \_\_\_\_\_.
3. Addendum # \_\_\_\_\_ Dated \_\_\_\_\_.
4. Addendum # \_\_\_\_\_ Dated \_\_\_\_\_.
5. Addendum # \_\_\_\_\_ Dated \_\_\_\_\_.





**SECTION 00 41 00  
BID FORM**

**DIVISION 00**

The undersigned acknowledges inclusion of the following allowances in the Base Bid in accordance with Section 012100 - Allowances:

- |   |                 |
|---|-----------------|
| 1. Allowance No. 1 – Miscellaneous Permit Allowance:          | \$5,000         |
| 2. Allowance No. 2 – Southern California Edison Allowance:    | \$50,000        |
| 3. Allowance No. 3 – Fire Extinguisher and Cabinet Allowance: | \$5,000         |
| <b>Total Allowances:</b>                                      | <b>\$60,000</b> |

The Bidder understands that unused portions of allowances will be adjusted by Change Order in accordance with the Contract Documents.

The following Supplements are attached to this Bid Form and are considered an integral part of this Bid Form:

1. Document 004313 - Bid Bond
2. Document 004336 - Proposed Subcontractors Form
3. Document 004513 - Bidder's Qualifications
4. Document 004546 - Governmental Certifications
  - a. Iran Contracting Act Certification
  - b. Ukraine Form of Compliance
  - c. Public Works Contractor Registration Certification
  - d. Contractor's Certificate Regarding Workers' Compensation
  - e. Fleet Compliance Certification
  - f. Certificate of Asbestos and Lead-Based Paint (New Work)
  - g. Non-Collusion Declaration



SECTION 00 41 00  
BID FORM

DIVISION 00

**TOTAL BASE BID PRICE:**

**TOTAL BASE BID PRICE FOR GOLETA VALLEY LIBRARY ADA,  
BUILDING, AND SAFETY IMPROVEMENT PROJECT (CIP 9130)**

\$ \_\_\_\_\_  
Total Bid Price in Numbers

\$ \_\_\_\_\_  
Total Bid Price in Written Form

**In case of discrepancy between the written price and the numerical price, the  
written price shall prevail.**

**ALTERNATIVE BID PRICE NO. 1:**

**TOTAL ALTERNATIVE #1 FOR GOLETA VALLEY LIBRARY ADA,  
BUILDING, AND SAFETY IMPROVEMENT PROJECT (CIP 9130)**

Carpet Replacement (Rooms 01, 02, 03, 13, and 23)

\$ \_\_\_\_\_  
Total Bid Price in Numbers

\$ \_\_\_\_\_  
Total Bid Price in Written Form

**In case of discrepancy between the written price and the numerical price, the  
written price shall prevail.**

**CONTINUED ON NEXT PAGE**



**SECTION 00 41 00  
BID FORM**

**DIVISION 00**

**ALTERNATIVE BID PRICE NO. 2:**

**TOTAL ALTERNATIVE #2 FOR GOLETA VALLEY LIBRARY ADA,  
BUILDING, AND SAFETY IMPROVEMENT PROJECT (CIP 9130)**

Lobby and Vestibule Tile Replacement (Rooms 21 and 25)

\$ \_\_\_\_\_  
Total Bid Price in Numbers

\$ \_\_\_\_\_  
Total Bid Price in Written Form

**In case of discrepancy between the written price and the numerical price, the written price shall prevail.**

**ALTERNATIVE BID PRICE NO. 3:**

**TOTAL ALTERNATIVE #3 FOR GOLETA VALLEY LIBRARY ADA,  
BUILDING, AND SAFETY IMPROVEMENT PROJECT (CIP 9130)**

FF&E Infrastructure

\$ \_\_\_\_\_  
Total Bid Price in Numbers

\$ \_\_\_\_\_  
Total Bid Price in Written Form

**In case of discrepancy between the written price and the numerical price, the written price shall prevail.**



**SECTION 00 41 00  
BID FORM**

**DIVISION 00**

The undersigned agrees that this Bid Form constitutes a firm offer to the City which cannot be withdrawn for the number of calendar days indicated in the Notice Inviting Bids from and after the Bid opening, or until a Contract for the Work is fully executed by the City and a third party, whichever is earlier.

The successful bidder hereby agrees to sign the contract and furnish the necessary bonds and certificates of insurance within ten (10) working days after the City provides the successful bidder with the Notice of Award.

Upon receipt of the signed contract and other required documents, the contract will be executed by the City, after which the City will prepare a letter giving Contractor Notice to Proceed. The official starting date shall be the date of the Notice to Proceed, unless otherwise specified. The undersigned agrees to begin the Work within ten (10) working days of the date of the Notice to Proceed, unless otherwise specified.

The undersigned has examined the location of the proposed work and is familiar with the Drawings and Specifications and the local conditions at the place where work is to be done.

If awarded the contract, the undersigned agrees that there shall be paid by the undersigned and by all subcontractors to all laborers, workers and mechanics employed in the execution of such contract no less than the prevailing wage rate within Santa Barbara County for each craft, classification, or type of worker needed to complete the Work contemplated by this contract as established by the Director of the Department of Industrial Relations. A copy of the prevailing rate of per diem wages are on file at the City's Engineering Division and shall be made available to interested parties upon request.

Enclosed find cash, bidder's bond, or cashier's or certified check No. \_\_\_\_\_ from the \_\_\_\_\_ Bank in the amount of \_\_\_\_\_, which is not less than ten percent (10%) of this bid, payable to City of Goleta as bid security and which is given as a guarantee that the undersigned will enter into a contract and provide the necessary bonds and certificates of insurance if awarded the Work.

The bidder furthermore agrees that in case of bidder's default in executing said contract and furnishing required bonds and certificates of insurance, the cash, bidder's bond, or cashier's or certified check accompanying this proposal and the money payable thereon shall become and shall remain the property of the City of Goleta.

Bidder is an individual \_\_\_\_\_, or corporation \_\_\_\_\_, or partnership \_\_\_\_\_, organized under the laws of the State of \_\_\_\_\_.

**CONTINUED ON NEXT PAGE**



**SECTION 00 41 00  
BID FORM**

**DIVISION 00**

Bidder confirms license(s) required by California State Contractor's License Law for the performance of the subject project are in full effect and proper order. The following are the Bidder's applicable license number(s), with their expiration date(s) and class of license(s):

---

---

---

If the Bidder is a joint venture, each member of the joint venture must include the required licensing information.

Sureties that will furnish the Faithful Performance Bond and the Labor and Material Payment Bond, in the form specified herein (Section 006113), in an amount equal to one hundred percent (100%) of the contract price within ten (10) working days from the date the City provides the successful bidder the Notice of Award. Sureties must meet all of the State of California bonding requirements, as defined in California Code of Civil Procedure Section 995.120 and must be authorized by the State of California.

The insurance company or companies to provide the insurance required in the contract documents must have a Financial Strength Rating of not less than "A-" and a Financial Size Category of not less than "Class VII" according to the latest Best Key Rating Guide. At the sole discretion of the City, the City may waive the Financial Strength Rating and the Financial Size Category classifications for Workers' Compensation insurance.

**CONTINUED ON NEXT PAGE**



**SECTION 00 41 00  
BID FORM**

**DIVISION 00**

I hereby certify under penalty of perjury under the laws of the State of California that all of the information submitted in connection with this Bid and all of the representations made herein are true and correct.

Executed at \_\_\_\_\_ on this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_.

(Corporate Seal)

(Bidders Name)

\_\_\_\_\_  
(Name and Title)

\_\_\_\_\_  
(Signature)

Names of individual members of firm or names and titles of all officers of corporation and their addresses are listed below:

Name: \_\_\_\_\_ Title: \_\_\_\_\_

Complete Address: \_\_\_\_\_

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_

Name: \_\_\_\_\_ Title: \_\_\_\_\_

Complete Address: \_\_\_\_\_

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_

Name: \_\_\_\_\_ Title: \_\_\_\_\_

Complete Address: \_\_\_\_\_

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_

Name: \_\_\_\_\_ Title: \_\_\_\_\_

Complete Address: \_\_\_\_\_

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_

**END OF SECTION**



SECTION 00 43 13  
BID BOND

DIVISION 00

**[Note: Not required when other form of Bidder's Security, e.g. cash, certified check or cashier's check, accompanies bid.]**

The makers of this bond are, \_\_\_\_\_, as Principal, and \_\_\_\_\_, as Surety and are held and firmly bound unto the City of Goleta, hereinafter called the City, in the penal sum of **TEN PERCENT (10%) OF THE TOTAL BID PRICE** of the Principal submitted to City 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, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH that whereas the Principal has submitted the accompanying bid dated \_\_\_\_\_, 20\_\_\_\_ for the **GOLETA VALLEY LIBRARY, ADA, SAFETY, and BUILDING IMPROVEMENT PROJECT NO. 9130.**

If the Principal does not withdraw its Bid within the time specified in the Contract Documents; and if the Principal is awarded the Contract and provides all documents to the City as required by the Contract Documents; then this obligation shall be null and void. Otherwise, this bond will remain in full force and effect.

Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract Documents shall in affect its obligation under this bond, and Surety does hereby waive notice of any such changes.

In the event a lawsuit is brought upon this bond by the City and judgment is recovered, the Surety shall pay all litigation expenses incurred by the City in such suit, including reasonable attorneys' fees, court costs, expert witness fees and expenses.

By their signatures hereunder, Surety and Principal hereby confirm under penalty of perjury that surety is an admitted surety insurer authorized to do business in the State of California.

IN WITNESS WHEREOF, the above-bound parties have executed this instrument under their several seals this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, the name and corporate seal of each corporation.

(Corporate Seal)

\_\_\_\_\_  
**Contractor/ Principal**

By \_\_\_\_\_

Title \_\_\_\_\_

(Corporate Seal)

\_\_\_\_\_  
**Surety**

By \_\_\_\_\_

(Attach Attorney-in-Fact Certificate)

\_\_\_\_\_  
**Attorney-in-Fact**

Title \_\_\_\_\_

**100% CD - IFB**

**00 43 13-1**



SECTION 00 43 13  
BID BOND

DIVISION 00

**Notary Acknowledgment**

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.

STATE OF CALIFORNIA  
COUNTY OF \_\_\_\_\_

On \_\_\_\_\_, 20\_\_\_\_, before me, \_\_\_\_\_, Notary Public, personally  
Date Name And Title Of Officer (e.g. "Jane Doe, Notary Public")  
appeared \_\_\_\_\_, who proved to me on the basis of satisfactory

Name(s) of Signer(s)

evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Place Notary Seal Above

\_\_\_\_\_  
Signature of Notary Public

**OPTIONAL**

*Though the information below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent removal and reattachment of this form to another document.*

**CAPACITY CLAIMED BY SIGNER**

**DESCRIPTION OF ATTACHED DOCUMENT**

- ☐ Individual  
☐ Corporate Officer

Title(s)

Title or Type of Document

- ☐ Partner(s) ☐ Limited  
☐ General

Number of Pages

- ☐ Attorney-In-Fact  
☐ Trustee(s)  
☐ Guardian/Conservator  
☐ Other:

Date of Document

Signer is representing:  
Name Of Person(s) Or Entity(ies)

\_\_\_\_\_  
Signer(s) Other Than Named Above

NOTE: This acknowledgment is to be completed for Contractor/Principal.





SECTION 00 43 13  
BID BOND

DIVISION 00

**Notary Acknowledgment**

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.

STATE OF CALIFORNIA  
COUNTY OF \_\_\_\_\_

On \_\_\_\_\_, 20\_\_\_\_, before me, \_\_\_\_\_, Notary Public, personally  
Date Name And Title Of Officer (e.g. "Jane Doe, Notary Public")  
appeared \_\_\_\_\_, who proved to me on the basis of satisfactory  
Name(s) of Signer(s)

evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Place Notary Seal Above

Signature of Notary Public

**OPTIONAL**

*Though the information below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent removal and reattachment of this form to another document.*

**CAPACITY CLAIMED BY SIGNER**

**DESCRIPTION OF ATTACHED DOCUMENT**

- ☐ Individual  
☐ Corporate Officer

Title(s)		Title or Type of Document
<input type="checkbox"/> Partner(s)	<input type="checkbox"/> Limited <input type="checkbox"/> General	Number of Pages
<input type="checkbox"/> Attorney-In-Fact		Date of Document
<input type="checkbox"/> Trustee(s)		
<input type="checkbox"/> Guardian/Conservator		
<input type="checkbox"/> Other:		
Signer is representing: Name Of Person(s) Or Entity(ies)		Signer(s) Other Than Named Above

NOTE: This acknowledgment is to be completed for the Attorney-in-Fact. The Power-of-Attorney to local representatives of the bonding company must also be attached.

**END OF BID BOND**



**SECTION 00 43 25  
SUBSTITUTION REQUEST  
FORM - DURING  
PROCUREMENT**

**DIVISION 00**

**SUBSTITUTION REQUEST FORM - DURING PROCUREMENT**

**(Prior to Bid Opening – Minimum of (15) Calendar Days Prior to Receipt of Bids)**

To: City Project Manager, City of Goleta  
Project: Goleta Valley Library ADA, Safety, And Building Improvement (CIP 9130)

Contractor: \_\_\_\_\_ Substitution Request Number: \_\_\_\_\_

Specification Title: \_\_\_\_\_ Description: \_\_\_\_\_

Section: \_\_\_\_\_ Page: \_\_\_\_\_ Article/Paragraph: \_\_\_\_\_

Proposed Substitution: \_\_\_\_\_

Manufacturer: \_\_\_\_\_

Address: \_\_\_\_\_ Phone: \_\_\_\_\_

Trade Name: \_\_\_\_\_ Model No.: \_\_\_\_\_

Attached data includes product description, specifications, drawings, photographs, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.



**SECTION 00 43 25  
SUBSTITUTION REQUEST  
FORM - DURING  
PROCUREMENT**

**DIVISION 00**

**SUBMITTED BY:**

The undersigned Contractor certifies that the function, appearance, and quality of the proposed substitution are equivalent or superior to those of the specified item.

Contractor	Name	Title
<hr/>		
Signature	Date	
<hr/>		
Address	City/State/Zip	
<hr/>		
Telephone	Email	
<hr/>		

**A/E's REVIEW AND ACTION:**

- ☐ Substitution approved - Make submittals in accordance with Specification Section 01 60 00 Materials, Equipment, and Product Requirements.
- ☐ Substitution approved as noted - Make submittals in accordance with Specification Section 01 60 00 Materials, Equipment, and Product Requirements.
- ☐ Substitution rejected - Use specified materials.
- ☐ Substitution Request received too late - Use specified materials.

By: \_\_\_\_\_  
A/E Representative                      Date

Supporting Data Attached:

☐ Drawings   ☐ Product Data   ☐ Samples   ☐ Tests   ☐ Reports   ☐ \_\_\_\_\_

**END OF SECTION**



**DIVISION 00**

**GOLETA VALLEY LIBRARY ADA, BUILDING, AND SAFETY IMPROVEMENT PROJECT  
BID NO. 2025-07**

<b>Division #</b>	<b>Division Description (as applicable)</b>	<b>Division Total</b>
01	General Conditions/Requirements	
02	Existing Conditions	
03	Concrete	
04	Masonry	
05	Metals	
06	Wood, Plastics & Composites	
07	Thermal & Moisture Protection	
08	Openings	
09	Finishes	
10	Specialties	
11	Equipment (Not Used)	
12	Furnishings	
13	Special Construction (Not Used)	
14	Conveying System (Not Used)	
21	Fire Suppression	
22	Plumbing	
23	Heating, Ventilating, & Air Conditioning (HVAC)	
25	Integrated Automation (Not Used)	
26	Electrical	
27	Communications	
28	Electronic Safety and Security	
31	Earthwork	
32	Exterior Improvements	
33	Utilities	
	Other	
Divisions Total		
Overhead and Profit		
Insurance		
Cost of Payment, Labor/Material, and Performance Bonds		
Allowance 1 (Miscellaneous Permit Allowance)		\$5,000
Allowance 2 (Southern California Edison Allowance)		\$50,000
Allowance 3 (Fire Extinguisher & Cabinets Allowance)		\$5,000
<b>TOTAL BID AMOUNT</b> (This amount must match the amount entered on the Bid Form)		



**SECTION 00 43 27  
SUMMARY OF COST AND  
BID BREAKDOWN**

**DIVISION 00**

This is a preliminary breakdown. It must be submitted within forty-eight (48) hours after the Bid Opening Date. This form does not replace or take precedence over the Schedule of Values set and agreed to after award of the Contract.

\_\_\_\_\_  
Firm Name (as indicated on the Bid Form):

By: \_\_\_\_\_  
(Signature of Bidder's Authorized Officer  
or Representative)

\_\_\_\_\_  
(Typed or Printed Name)

Title: \_\_\_\_\_

Date: \_\_\_\_\_

**END OF SECTION**



**SECTION 00 43 36  
PROPOSED  
SUBCONTRACTORS FORM**

**DIVISION 00**

**1.01 DESIGNATION OF SUBCONTRACTORS**

- A. In compliance with the Subletting and Subcontracting Fair Practices Act Chapter 4 (commencing at Section 4100), Part 1, Division 2 of the Public Contract Code of the State of California and any amendments thereof, Bidder shall set forth below: (a) the name and the location of the place of business, (b) the California contractor license number, (c) the DIR public works contractor registration number unless exempt pursuant to Labor Code Sections 1725.5 and 1771.1, and (d) the portion of the work which will be done by each subcontractor who will perform work or labor or render service to the Bidder in or about the construction of the work or improvement to be performed under this Contract in an amount in excess of one-half of one percent (0.5%) of the Bidder's Total Bid Price.
- B. If a Bidder fails to specify a subcontractor or if a contractor specifies more than one subcontractor for the same portion of work, then the Bidder shall be deemed to have agreed that it is fully qualified to perform that portion of work and that it shall perform that portion itself.

NOTE 1: BIDDERS HAVE 24 HOURS AFTER THE BID DEADLINE TO SUBMIT THIS INFORMATION.

NOTE 2: ATTACH ADDITIONAL SHEETS IF NECESSARY.

**HEREWITH IS THE LIST OF SUBCONTRACTORS REFERENCED IN THE BID SUBMITTED BY:**

(BIDDER) \_\_\_\_\_

(SIGNATURE) \_\_\_\_\_

(NAME AND TITLE) \_\_\_\_\_

TO (OWNER): CITY OF GOLETA

Dated \_\_\_\_\_ and which is an integral part of the Bid Form.

**CONTINUED ON NEXT PAGE**



**SECTION 00 43 36  
PROPOSED  
SUBCONTRACTORS FORM**

**DIVISION 00**

<b>WORK TO BE DONE BY SUBCONTRACTOR</b>	<b>NAME OF SUBCONTRACTOR</b>	<b>LOCATION OF BUSINESS (CITY, STATE)</b>	<b>CSLB CONTRACTOR LICENSE NO.</b>	<b>DIR REGISTRATION NUMBER (NOTE 1)</b>	<b>% OF WORK</b>

**END OF SECTION**



**SECTION 00 45 13  
BIDDER'S QUALIFICATIONS**

**DIVISION 00**

**PART 1 - BIDDER INFORMATION AND EXPERIENCE**

**1.01 INFORMATION ABOUT BIDDER**

(Indicate ("N/A") where appropriate.)

Note: Where Bidder is a joint venture, pages shall be duplicated and information provided for all parties to the joint venture.

Name of Bidder: \_\_\_\_\_

A. Type, if Entity: \_\_\_\_\_

B. Bidder Address: \_\_\_\_\_

C. Facsimile (Fax) Number: \_\_\_\_\_

D. Telephone Number: \_\_\_\_\_

E. Email Address: \_\_\_\_\_

F. How many years has Bidder's organization been in business as a Contractor?

\_\_\_\_\_

G. How many years has Bidder's organization been in business under its present name?

\_\_\_\_\_

1. Under what other or former names has Bidder's organization operated? \_\_\_\_\_

H. If Bidder's organization is a corporation, answer the following:

1. Date of Incorporation: \_\_\_\_\_

2. State of Incorporation: \_\_\_\_\_

3. President's Name: \_\_\_\_\_

4. Vice-President's Name(s): \_\_\_\_\_

5. Secretary's Name: \_\_\_\_\_

6. Treasurer's Name: \_\_\_\_\_

I. If an individual or a partnership, answer the following:

1. Date of Organization: \_\_\_\_\_

2. Name and address of all partners (state whether general or limited partnership):

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

J. If other than a corporation or partnership, describe organization and name principals:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

K. List other states in which Bidder's organization is legally qualified to do business.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

L. What type of work does the Bidder normally perform with its own forces?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_





**SECTION 00 45 13  
BIDDER'S QUALIFICATIONS**

**DIVISION 00**

M. Has Bidder ever failed to complete any work awarded to it? If so, note when, where, and why:

---

---

---

N. Within the last five years, has any officer or partner of Bidder's organization ever been an officer or partner of another organization when it failed to complete a contract? If so, attach a separate sheet of explanation:

---

---

---

O. List Trade References:

---

---

---

P. List Bank References (Bank and Branch Address):

---

---

---

Q. Name of Bonding Company and Name and Address of Agent:

---

---

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**[REMAINDER OF THIS PAGE INTENTIONALLY LEFT BLANK]**



**SECTION 00 45 13  
BIDDER'S QUALIFICATIONS**

**DIVISION 00**

**1.02 LIST OF CURRENT PROJECTS (BACKLOG)**

Duplicate Page if needed for listing additional current projects.

Project	Description of Bidder's Work	Estimated Completion Date	Cost of Bidder's Work



**SECTION 00 45 13  
BIDDER'S QUALIFICATIONS**

**DIVISION 00**

**1.03 LIST OF COMPLETED PROJECTS – LAST THREE YEARS**

Please include only those projects which are similar enough to demonstrate Bidder's ability to perform the required Work.

Duplicate Page if needed for listing additional current projects.

Project	Description of Bidder's Work	Completion Date	Cost of Bidder's Work

**END OF SECTION**



**SECTION 00 45 46  
GOVERNMENTAL  
CERTIFICATIONS**

**DIVISION 00**

**MUST BE SUBMITTED WITH BID**

- 1.01 IRAN CONTRACTING CERTIFICATION**
- 1.02 UKRAINE COMPLIANCE FORM**
- 1.03 PUBLIC WORKS CONTRACTOR REGISTRATION CERTIFICATION**
- 1.04 CONTRACTOR'S CERTIFICATION REGARDING WORKERS' COMPENSATION**
- 1.05 FLEET COMPLIANCE CERTIFICATION**
- 1.06 CERTIFICATE OF ASBESTOS AND LEAD-BASED PAINT (NEW WORK)**
- 1.07 NON-COLLUSION DECLARATION**

**CONTINUED ON NEXT PAGE**



**SECTION 00 45 46  
GOVERNMENTAL  
CERTIFICATIONS**

**DIVISION 00**

**1.01 IRAN CONTRACTING CERTIFICATION**

(Public Contract Code section 2200 *et seq.*)

As required by California Public Contract Code Section 2204, the Contractor certifies subject to penalty for perjury that the option checked below relating to the Contractor's status in regard to the Iran Contracting Act of 2010 (Public Contract Code Section 2200 *et seq.*) is true and correct:

- ☐ The Contractor is not:
- (1) identified on the current list of persons and entities engaged in investment activities in Iran prepared by the California Department of General Services in accordance with subdivision (b) of Public Contract Code Section 2203; or
  - (2) a financial institution that extends, for 45 days or more, credit in the amount of \$20,000,000 or more to any other person or entity identified on the current list of persons and entities engaging in investment activities in Iran prepared by the California Department of General Services in accordance with subdivision (b) of Public Contract Code Section 2203, if that person or entity uses or will use the credit to provide goods or services in the energy sector in Iran.
- ☐ The City has exempted the Contractor from the requirements of the Iran Contracting Act of 2010 after making a public finding that, absent the exemption, the City will be unable to obtain the goods and/or services to be provided pursuant to the Contract.
- ☐ The amount of the Contract payable to the Contractor for the Project does not exceed \$1,000,000.

Signature: \_\_\_\_\_

Printed Name: \_\_\_\_\_

Title: \_\_\_\_\_

Firm Name: \_\_\_\_\_

Date: \_\_\_\_\_

Note: In accordance with Public Contract Code Section 2205, false certification of this form shall be reported to the California Attorney General and may result in civil penalties equal to the greater of \$250,000 or twice the Contract amount, termination of the Contract and/or ineligibility to bid on contracts for three years.



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GOVERNMENTAL  
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1.02 UKRAINE COMPLIANCE FORM

COMPLIANCE WITH ECONOMIC SANCTIONS  
IN RESPONSE TO RUSSIA'S ACTIONS IN UKRAINE

SAPC Information Notice 22-15

*Per Executive Order N-6-22, all contractors and grantees that have agreements valued at \$5 million or more with agencies/departments subject to the California Governor's authority are directed to report to their contracting or grantor agency or department regarding their compliance with economic sanctions imposed by the U.S. government in response to Russia's actions in Ukraine, as well as sanctions imposed under state law, if any.*

**Instructions: Complete Section 1, provide a letter for Section 2 and return both to your CPA.**

**1) ATTESTATION OF COMPLIANCE:**

Having conducted a good faith review, I attest that \_\_\_\_\_  
(agency name) is in compliance with the economic sanctions imposed by the U.S. under state law, if any.

<b>Contractor/Provider Name (Printed):</b>	<b>Contract Number(s):</b>
<b>By (Authorized Signature):</b>	
<b>Printed name and title of authorized signer:</b>	
<b>Date of Signed Attestation of Compliance:</b>	

**2) REPORT OF ACTIONS/STEPS TAKEN:**

Attach a brief report to this notice form, on your agency letterhead describing the steps and actions, if any, you have taken in response to Russia's actions in Ukraine and to ensure compliance with the EO. *Please note that responses may be subject to disclosure under the California Public Records Act. Accordingly, please do not include any confidential information or disclosures that could pose security risks.*



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**1.03 PUBLIC WORKS CONTRACTOR REGISTRATION CERTIFICATION**

Pursuant to Labor Code sections 1725.5 and 1771.1, all contractors and subcontractors that wish to bid on, be listed in a bid proposal, or enter into a contract to perform public work must be registered with the Department of Industrial Relations. See <http://www.dir.ca.gov/Public-Works/PublicWorks.html> for additional information.

No bid will be accepted nor any contract entered into without proof of the contractor's and subcontractors' current registration with the Department of Industrial Relations to perform public work.

Bidder hereby certifies that it is aware of the registration requirements set forth in Labor Code sections 1725.5 and 1771.1 and is currently registered as a contractor with the Department of Industrial Relations.<sup>1</sup>

Name of Bidder: \_\_\_\_\_

DIR Registration Number: \_\_\_\_\_

DIR Registration Expiration: \_\_\_\_\_

Small Project Exemption: \_\_\_\_\_ Yes or \_\_\_\_\_ No

Unless Bidder is exempt pursuant to the small project exemption, Bidder further acknowledges:

1. Bidder shall maintain a current DIR registration for the duration of the project.
2. Bidder shall include the requirements of Labor Code sections 1725.5 and 1771.1 in its contract with subcontractors and ensure that all subcontractors are registered at the time of bid opening and maintain registration status for the duration of the project.
3. Failure to submit this form or comply with any of the above requirements may result in a finding that the bid is non-responsive.

Name of Bidder \_\_\_\_\_

Signature \_\_\_\_\_

Name and Title \_\_\_\_\_

Dated \_\_\_\_\_

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<sup>1</sup> If the Project is exempt from the contractor registration requirements pursuant to the small project exemption under Labor Code Sections 1725.5 and 1771.1, please mark "Yes" in response to "Small Project Exemption."



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**1.04 CONTRACTOR'S CERTIFICATION REGARDING WORKERS' COMPENSATION**

I am 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 I will comply with such provisions before commencing the performance of the work of this Contract.

Name of Bidder \_\_\_\_\_

Signature \_\_\_\_\_

Name \_\_\_\_\_

Title \_\_\_\_\_

Dated \_\_\_\_\_





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**1.05 FLEET COMPLIANCE CERTIFICATION**

Bidder hereby acknowledges that they have reviewed the California Air Resources Board's policies, rules and regulations and are familiar with the requirements of Title 13, California Code of Regulations, Division 3, Chapter 9, effective on January 1, 2024 (the "Regulation"). Bidder hereby certifies, subject to penalty for perjury, that the option checked below relating to the Bidder's fleet, and/or that of their subcontractor(s) ("Fleet") is true and correct:

- ☐ The Fleet is subject to the requirements of the Regulation, and the appropriate Certificate(s) of Reported Compliance have been attached hereto.
- ☐ The Fleet is exempt from the Regulation under section 2449.1(f)(2), and a signed description of the subject vehicles, and reasoning for exemption has been attached hereto.
- ☐ Bidder and/or their subcontractor is unable to procure R99 or R100 renewable diesel fuel as defined in the Regulation pursuant to section 2449.1(f)(3). Bidder shall keep detailed records describing the normal refueling methods, their attempts to procure renewable diesel fuel and proof that shows they were not able to procure renewable diesel (i.e. third-party correspondence or vendor bids).
- ☐ The Fleet is exempt from the requirements of the Regulation pursuant to section 2449(i)(4) because this Project has been deemed an Emergency, as defined under section 2449(c)(18). Bidder shall only operate the exempted vehicles in the emergency situation and records of the exempted vehicles must be maintained, pursuant to section 2449(i)(4).
- ☐ The Fleet does not fall under the Regulation or are otherwise exempted, and a detailed reasoning is attached hereto.

Name of Bidder: \_\_\_\_\_

Signature: \_\_\_\_\_

Name: \_\_\_\_\_

Title: \_\_\_\_\_

Date: \_\_\_\_\_



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**1.06 CERTIFICATE OF ASBESTOS AND LEAD-BASED PAINT (NEW WORK)**

To: City Project Manager  
Subject: Certification for New Construction  
City Facility Name: Goleta Valley Library  
City facility address: 500 North Fairview, Goleta, California

**Certification for new construction:**

This Contractor/Owner hereby certifies that no asbestos-containing material in excess of 1 percent as defined by applicable US Environmental Protection Agency regulations, and no lead-based paint has been furnished or installed at the referenced project.

Contractor/Owner Name: \_\_\_\_\_  
Signature: \_\_\_\_\_  
Address: \_\_\_\_\_  
Telephone: \_\_\_\_\_  
Date executed: \_\_\_\_\_



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**1.07 NON-COLLUSION DECLARATION**

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].

Name of Bidder

\_\_\_\_\_

Signature \_\_\_\_\_

Name \_\_\_\_\_

Title \_\_\_\_\_

**END OF SECTION**



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**PUBLIC WORKS CONTRACT  
BETWEEN THE CITY OF GOLETA  
AND**

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This Public Works Contract (herein referred to as "CONTRACT") is made and entered into by and between the **CITY OF GOLETA**, a municipal corporation (herein referred to as "CITY"), and \_\_\_\_\_, a \_\_\_\_\_ (hereinafter referred to as "CONTRACTOR").

**SECTION A. RECITALS**

1. Pursuant to the Notice Inviting Sealed Bids for the Goleta Valley Library, ADA, Building, and Safety Improvement Project (CIP 9130), bids were received, publicly opened, and declared on the date specified in the notice.
2. On \_\_\_\_\_, Goleta's City Council declared CONTRACTOR to be the lowest responsible bidder and accepted the bid of CONTRACTOR and the City Council approved this CONTRACT and authorized the City Manager to execute the CONTRACT with CONTRACTOR for furnishing labor, equipment, and material for the Goleta Valley Library, ADA, Building, and Safety Improvement Project (CIP 9130) in the City of Goleta.

**NOW, THEREFORE**, in consideration of the foregoing and the mutual covenants herein contained, it is agreed:

**SECTION B. TERMS**

1. **GENERAL SCOPE OF WORK:** CITY agrees to engage CONTRACTOR and CONTRACTOR agrees to furnish all necessary labor, tools, materials, appliances, and equipment for and do the work for the **Goleta Valley Library Building, Safety, and ADA Improvement Project (CIP 9130)** in the City of Goleta. The work shall be performed in accordance with the Plans and Specifications (and as generally described in the "Notice Inviting Sealed Bids," attached as Exhibit A) and in accordance with bid prices set forth in CONTRACTOR'S Bid Proposal (attached as Exhibit B) and in accordance with the instructions of the City Engineer, or City's Manager's designee.
2. **INCORPORATED DOCUMENTS TO BE CONSIDERED COMPLEMENTARY:**  
The contract documents for the aforesaid project, a complete set of which is on file with the Goleta City Clerk's Office, shall consist of the Notice Inviting Bids, Instructions to Bidders, Bid Proposal, Standard Specifications, Special Provisions, and all referenced specifications, details, standard drawings, and appendices; together with this CONTRACT and all required bonds, insurance certificates,



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permits, notices and affidavits; and also, including any and all addenda or supplemental agreements clarifying, amending, or extending the work contemplated as may be required to insure its completion in an acceptable manner. All of the provisions of said contract documents are made a part hereof as though fully set forth herein. This contract is intended to require a complete and finished piece of work and anything necessary to complete the work properly and in accordance with the law and lawful governmental regulations shall be performed by CONTRACTOR whether set out specifically in the contract or not. Should it be ascertained that any inconsistency exists between the aforesaid documents and this written CONTRACT, the provisions of this CONTRACT, and the Standard Specifications, in that order, shall control. Collectively, these contract documents constitute the complete CONTRACT between CITY and CONTRACTOR and supersede any previous agreements or understandings.

3. **COMPENSATION:** CONTRACTOR agrees to receive and accept the prices set forth in its Bid Proposal as full compensation for furnishing all materials, performing all work, and fulfilling all obligations hereunder. Said compensation shall cover all expenses, losses, damages, and consequences arising out of the nature of the work during its progress or prior to its acceptance including those for well and faithfully completing the work and the whole thereof in the manner and time specified in the aforesaid contract documents; and also including those arising from actions of the elements, unforeseen difficulties or obstructions encountered in the prosecution of the work, suspension or discontinuance of the work, and all other unknowns or risks of any description connected with the work.
4. **TIME OF PERFORMANCE:** CONTRACTOR agrees to complete the work within the timeframe specified in the Contract Documents from the date of the notice to proceed. By signing this CONTRACT, CONTRACTOR represents to CITY that the contract time is reasonable for completion of the work and that CONTRACTOR will complete such work within the contract time. In accordance with Government Code Section 53069.85, CONTRACTOR agrees to forfeit and pay CITY as liquidated damages, not as a penalty, the sum of **\$3,000** per day for each and every day of unauthorized delay beyond the completion date, which amount shall be deducted from any payments due or to become due the CONTRACTOR.
5. **PREVAILING WAGES:**
  - A. Pursuant to Labor Code Sections §§1720 *et seq.*, including but not limited to sections 1771, 1774 and 1775, and as specified in Title 8, California Code of Regulations, Section 16000 *et seq.*, CONTRACTOR must pay its workers prevailing wages. It is CONTRACTOR's responsibility to interpret and



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implement any prevailing wage requirements and CONTRACTOR agrees to pay any penalty or civil damages resulting from a violation of the prevailing wage laws.

- B. In accordance with Labor Code Section 1773.2, copies of the prevailing rate of per diem wages are available upon request from CITY's Engineering Division or the website for State of California Prevailing wage determination at <http://www.dir.ca.gov/DLSR/PWD>. CONTRACTOR must post a copy of the prevailing rate of per diem wages at the job site.
- C. CITY directs CONTRACTOR's attention to Labor Code Sections 1777.5, 1777.6 and 3098 concerning the employment of apprentices by CONTRACTOR or any subcontractor.
- D. Labor Code Section 1777.5 requires CONTRACTOR or subcontractor employing tradesmen in any apprenticeship occupation to apply to the joint apprenticeship committee nearest the site of the public works project and which administers the apprenticeship program in that trade for a certificate of approval. The certificate must also fix the ratio of apprentices to journeymen that will be used in the performance of the contract. The ratio of apprentices to journeymen in such cases will not be less than one to five except:
- (1) When employment in the area of coverage by the joint apprenticeship committee has exceeded an average of 15 percent in the 90 days before the request for certificate, or
  - (2) When the number of apprentices in training in the area exceeds a ratio of one to five, or
  - (3) When the trade can show that it is replacing at least 1/30 of its membership through apprenticeship training on an annual basis state-wide or locally, or
  - (4) When assignment of an apprentice to any work performed under a public works contract would create a condition that would jeopardize his or her life or the life, safety, or property of fellow employees or the public at large, or the specific task to which the apprentice is to be assigned is of a nature that training cannot be provided by a journeyman.

Pursuant to Labor Code § 1776, CONTRACTOR shall comply with all Department of Industrial Relations registration requirements.

- E. CONTRACTOR is required to make contributions to funds established for the administration of apprenticeship programs if CONTRACTOR employs



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registered apprentices or journeymen in any apprenticeable trade on such contracts and if other contractors on the public works site are making such contributions.

- F. CONTRACTOR and any subcontractor must comply with Labor Code Sections 1777.5 and 1777.6 in the employment of apprentices.
  - G. Information relative to apprenticeship standards, wage schedules and other requirements may be obtained from the Director of Industrial Relations (DIR), ex-officio the Administrator of Apprenticeship, San Francisco, California, or from the Division of Apprenticeship Standards and its branch offices.
  - H. CONTRACTOR and its subcontractors must keep an accurate certified payroll records showing the name, occupation, and the actual per diem wages paid to each worker employed in connection with this CONTRACT. The record will be kept open at all reasonable hours to the inspection of the body awarding the contract and to the Division of Labor Law Enforcement. If requested by CITY, CONTRACTOR must provide copies of the records at its cost.
- 6. LEGAL HOURS OF WORK:** CONTRACTOR agrees to comply with the provisions of California Labor Code Section 1813 concerning penalties for workers who work excess hours. Except as provided by Labor Code Section 1815, the CONTRACTOR shall, as a penalty to the CITY, forfeit twenty five dollars (\$25) for each worker employed in the execution of the Contract by the CONTRACTOR or by any Subcontractor for each calendar day during which such worker is required or permitted to work more than 8 hours in any one calendar day and 40 hours in any one calendar week in violation of the provisions of Division 2, Part 7, Chapter 1, Article 3 (commencing at Section 1810) of the California Labor Code.
- 7. TRAVEL AND SUBSISTENCE PAY:** CONTRACTOR agrees to pay travel and subsistence pay to each worker needed to execute the work required by this CONTRACT as such travel and subsistence payments are defined in the applicable collective bargaining agreements filed in accordance with Labor Code Section 1773.8.
- 8. CONTRACTOR'S LIABILITY:** The CITY and its officers, agents and employees ("Indemnitees") shall not be answerable or accountable in any manner for any loss or damage that may happen to the work or any part thereof, or for any of the materials or other things used or employed in performing the work; or for injury or damage to any person or persons, either workers or employees of CONTRACTOR, of its subcontractors or the public, or for damage to adjoining or



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other property from any cause whatsoever arising out of or in connection with the performance of the work. CONTRACTOR shall be responsible for any damage or injury to any person or property resulting from defects or obstructions or from any cause whatsoever.

CONTRACTOR will indemnify Indemnities against and will hold and save Indemnites harmless from any and all actions, claims, damages to persons or property, penalties, obligations or liabilities that may be asserted or claimed by any person, firm, entity, corporation, political subdivision, or other organization arising out of or in connection with the work, operation, or activities of CONTRACTOR, its agents, employees, subcontractors or invitees provided for herein, whether or not there is concurrent passive negligence on the part of CITY. In connection therewith:

- a. CONTRACTOR will defend any action or actions filed in connection with any such claims, damages, penalties, obligations or liabilities and will pay all costs and expenses, including attorneys' fees, expert fees and costs incurred in connection therewith.
- b. CONTRACTOR will promptly pay any judgment rendered against CONTRACTOR or Indemnites covering such claims, damages, penalties, obligations and liabilities arising out of or in connection with such work, operations or activities of CONTRACTOR hereunder, and CONTRACTOR agrees to save and hold the Indemnites harmless therefrom.
- c. In the event Indemnites are made a party to any action or proceeding filed or prosecuted against CONTRACTOR for damages or other claims arising out of or in connection with the work, operation or activities hereunder, CONTRACTOR agrees to pay to Indemnites and any all costs and expenses incurred by Indemnites in such action or proceeding together with reasonable attorneys' fees.

CONTRACTOR'S obligations under this section apply regardless of whether or not such claim, charge, damage, demand, action, proceeding, loss, stop notice, cost, expense, judgment, civil fine or penalty, or liability was caused in part or contributed to by an Indemnitee. However, without affecting the rights of CITY under any provision of this CONTRACT, Contractor shall not be required to indemnify and hold harmless CITY for liability attributable to the active negligence of CITY, provided such active negligence is determined by agreement between the parties or by the findings of a court of competent jurisdiction. In instances where CITY is shown to have been actively negligent and where CITY active negligence accounts for only a percentage of the liability involved, the obligation of Contractor





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will be for that entire portion or percentage of liability not attributable to the active negligence of City.

So much of the money due to CONTRACTOR under and by virtue of the contract as shall be considered necessary by CITY may be retained by CITY until disposition has been made of such actions or claims for damages as aforesaid.

It is expressly understood and agreed that the foregoing provisions are intended to be as broad and inclusive as is permitted by the law of the State of California. This indemnity provision shall survive the termination of the CONTRACT and is in addition to any other rights or remedies which Indemnitees may have under the law.

This indemnity is effective without reference to the existence or applicability of any insurance coverage which may have been required under this CONTRACT or any additional insured endorsements which may extend to Indemnitees.

CONTRACTOR, on behalf of itself and all parties claiming under or through it, hereby waives all rights of subrogation and contribution against the Indemnitees, while acting within the scope of their duties, from all claims, losses and liabilities arising out of or incident to activities or operations performed by or on behalf of the CONTRACTOR regardless of any prior, concurrent, or subsequent passive negligence by the Indemnitees.

**9. THIRD-PARTY CLAIMS:** In accordance with Public Contracts Code Section 9201, CITY will promptly inform CONTRACTOR regarding third-party claims against CONTRACTOR, but in no event later than ten (10) business days after CITY receives such claims. Such notification will be in writing and forwarded in accordance with the "Notice" section of this CONTRACT. As more specifically detailed in the contract documents, CONTRACTOR agrees to indemnify and defend the City against any third-party claim.

**10. WORKERS COMPENSATION:** In accordance with California Labor Code Sections 1860 and 3700, CONTRACTOR and each of its subcontractors will be required to secure the payment of compensation to its employees. In accordance with the provisions of California Labor Code Section 1861, CONTRACTOR, by signing this contract, certifies as follows: "I am aware of the provisions of Section 3700 of the Labor Code which require every employer to be insured against liability for worker's compensation or to undertake self-insurance in accordance with the provisions of that code, and I will comply with such provisions before commencing the performance of the work of this contract."



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- 11. INSURANCE:** With respect to performance of work under this CONTRACT, CONTRACTOR shall maintain and shall require all of its subcontractors to maintain insurance as required in the Standard Specifications.
- 12. ASSIGNMENT:** This CONTRACT is not assignable nor the performance of either party's duties delegable without the prior written consent of the other party. Any attempted or purported assignment or delegation of any of the rights of obligations of either party without the prior written consent of the other shall be void and of no force and effect.
- 13. INDEPENDENT CONTRACTOR:** CONTRACTOR is and shall at all times remain as to the CITY, a wholly independent contractor. Neither the CITY nor any of its agents shall have control of the conduct of CONTRACTOR or any of CONTRACTOR'S employees, except as herein set forth. CONTRACTOR shall not at any time or in any manner represent that it or any of its agents or employees are in any manner agents or employees of CITY.
- 14. TAXES:** CONTRACTOR is responsible for paying all retail sales and use, transportation, export, import, special or other taxes and duties applicable to, and assessable against any work, materials, equipment, services, processes and operations incidental to or involved in this contract. CONTRACTOR is responsible for ascertaining and arranging to pay them. The prices established in the contract shall include compensation for any taxes CONTRACTOR is required to pay by laws and regulations in effect at the bid opening date.
- 15. LICENSES:** CONTRACTOR represents and warrants to CITY that it has all licenses, permits, qualifications, insurance, and approvals of whatsoever nature which are legally required of CONTRACTOR to practice its profession. CONTRACTOR represents and warrants to CITY that CONTRACTOR shall, at its sole cost and expense, keep in effect or obtain at all times during the term of this CONTRACT any licenses, permits, insurance, and approvals which are legally required of CONTRACTOR to practice its profession. CONTRACTOR shall maintain a City of Goleta business license, if required under CITY ordinance.
- 16. RECORDS:** CONTRACTOR shall maintain accounts and records, including personnel, property, and financial records, adequate to identify and account for all costs pertaining to this CONTRACT and such other records as may be deemed necessary by CITY or any authorized representative, and will be retained for three years after the expiration of this CONTRACT. All such records shall be made available for inspection or audit by CITY at any time during regular business hours.



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**17. SEVERABILITY:** If any portion of these contract documents are declared by a court of competent jurisdiction to be invalid or unenforceable, then such portion will be deemed modified to the extent necessary in the opinion of the court to render such portion enforceable and, as so modified, such portion and the balance of this CONTRACT will continue in full force and effect provided that it does not frustrate the mutual intent of the parties herein.

**18. WHOLE AGREEMENT:** This CONTRACT supersedes any and all other agreements either oral or written, between the parties and contains all of the covenants and agreements between the parties pertaining to the work of improvements described herein. Each party to this contract acknowledges that no representations, inducements, promises or agreements, orally or otherwise, have been made by any party, or anyone acting on behalf of any party, which are not embodied herein, and that any other agreement, statements or promise not contained in this contract shall not be valid or binding. Any modifications of this contract will be effective only if signed by the party to be charged.

**19. AUTHORITY:** CONTRACTOR affirms that the signatures, titles, and seals set forth hereinafter in execution of this CONTRACT represent all individuals, firm members, partners, joint ventures, and/or corporate officers having a principal interest herein. Each party warrants that the individuals who have signed this CONTRACT have the legal power, right, and authority to make this CONTRACT and to bind each respective party. This CONTRACT may be modified by written amendment. CITY's City Manager may execute any such amendment on CITY's behalf.

**20. NOTICES:** All notices permitted or required under this CONTRACT shall be in writing, and shall be deemed made when delivered to the applicable party's representative as provided in this CONTRACT. Additionally, such notices may be given to the respective parties at the following addresses, or at such other addresses as the parties may provide in writing for this purpose.

Such notices shall be deemed made when personally delivered or when mailed forty-eight (48) hours after deposit in the U.S. mail, first-class postage prepaid, and addressed to the party at its applicable address. Courtesy copies of notices may be sent via electronic mail, provided that the original notice is deposited in the U.S. mail or personally delivered as specified in this Section.

CITY OF GOLETA  
130 Cremona Drive, Suite B  
Goleta, CA 93117  
Attn: City Manager



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CONTRACTOR

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**21. DISPUTES:** Disputes arising from this contract will be determined in accordance with the contract documents.

**22. NONDISCRIMINATION:** The CITY reaffirms its ongoing commitment to equality in the conduct of City business, and prohibits any policy, plan, program, custom or practice, including harassment, in the conduct of City business. No discrimination or discriminatory practice shall occur in either employment of persons for, or completion of, the work contemplated by this CONTRACT, when such discrimination is based on race, color, national origin, or ancestry; religion; sex; gender, gender identity, gender expression, or gender transitioning status; physical disability, mental disability, medical condition, or genetic information; marital or domestic partner status; citizenship status; age; sexual orientation; exercising a legally protected right to an employment leave of absence; status as a victim of domestic violence, sexual assault, or stalking; reproductive health decision-making, or any other classification protected under state or federal law. Among other possible violations of law, a violation of this section exposes CONTRACTOR to the penalties provided for in Labor Code Section 1735.

**23. PAPER PRODUCTS AND PRINTING REQUIREMENTS:** To the extent this contract provides paper products, and printing and writing paper for the City, CONTRACTOR must meet quality standards and criteria specified in [SB 1383](#), [Sections 22150-22154 of the Public Contract Code](#) and [16 Code of Federal Regulations \(CFR\) Section 260.12](#) by:

- a. If fitness and quality are equal, provide recycled products, instead of nonrecycled products whenever recycled products are available at the same or a lesser total cost than nonrecycled items.
- b. Provide paper products and printing and writing paper that meet Federal Trade Commission recyclability standard as defined in 16 CFR Section 260.12.
- c. Certify in writing, under penalty of perjury, the minimum percentage of postconsumer material in the paper products and printing and writing paper offered or sold to the City. This certification requirement may be waived if the percentage of postconsumer material in the paper products, printing and writing paper, or both can be verified by a product label, catalog, invoice, or a manufacturer or vendor internet website.



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- d. Certify in writing, on invoices or receipts provided, that the paper products and printing and writing paper offered or sold to the City is eligible to be labeled with an unqualified recyclable label as defined in 16 CFR Section 260.12.
- e. Comply with any other requirements in Goleta Municipal Code Section 8.10.900(B).

**24. ORGANIC WASTE USE REQUIREMENTS:** To the extent this contract provides landscaping maintenance, renovation, and construction services, CONTRACTOR must:

- a. Use compost and SB 1383 eligible mulch, as practicable, produced from recovered organic waste, for all landscaping renovations, construction, or maintenance performed for the City, whenever available, and capable of meeting quality standards and criteria specified. SB 1383 eligible mulch used for land application must comply with 14 CCR Section 18993.1 - 18993.4, and must meet or exceed the physical contamination, maximum metal concentration and pathogen density standards specified in 14 CCR Sections 17852(a)(24.5)(A)(1) through (3).
- b. Keep and provide records of procurement of recovered organic waste products (either through purchase or acquisition) to the City's Designated Representative, upon completion of projects. Information to be provided must include:
  - i. General description of how and where the product was used and if applicable, applied;
  - ii. Source of product, including name, physical location, and contact information for each entity, operation, or facility from whom the recovered organic waste products were procured;
  - iii. Type of product;
  - iv. Quantity of each product; and,
  - v. Invoice or other record demonstrating purchase or procurement.
- c. Comply with all requirements in Goleta Municipal Code Section 8.10.900(A).

**25. NO THIRD-PARTY BENEFICIARY:** This CONTRACT and every provision herein is for the exclusive benefit of CONTRACTOR and CITY and not for the benefit of any other party. There will be no incidental or other beneficiaries of any of the CONTRACTOR's or the CITY's obligations under this Contract.



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**26. TIME IS OF ESSENCE:** Time is of the essence for each and every provision of the Contract Documents.

**27. ACCEPTANCE OF FACSIMILE OR ELECTRONIC SIGNATURES:** The Parties agree that this CONTRACT, agreements ancillary to this CONTRACT, and related documents to be entered into in connection with this CONTRACT will be considered signed when the signature of a party is delivered by facsimile transmission or scanned and delivered via electronic mail. Such facsimile or electronic mail copies will be treated in all respects as having the same effect as an original signature.

**28. GOVERNING LAW:** This CONTRACT shall be governed by the laws of the State of California, and exclusive venue for any action involving this CONTRACT will be in Santa Barbara County.

**IN WITNESS WHEREOF,** the parties hereto have executed this CONTRACT with all the formalities required by law on the respective dates set forth opposite their signatures.

This CONTRACT is executed on this \_\_\_\_\_ day of \_\_\_\_\_, at Goleta, California, and effective as of \_\_\_\_\_, 20\_\_\_\_.

**CITY OF GOLETA:**

\_\_\_\_\_  
Robert Nisbet, City Manager

**ATTEST:**

\_\_\_\_\_  
Deborah Lopez, City Clerk

**APPROVED AS TO FORM:**

ISAAC ROSEN, CITY ATTORNEY

\_\_\_\_\_  
Scott Shapses, Deputy City Attorney



**SECTION 00 52 13  
AGREEMENT FORM - PUBLIC  
WORKS CONTRACT**

**DIVISION 00**

**CONTRACTOR:**

---

Name, Title

State of California License No.

---

---

Department of Industrial Relations Registration  
No.

---

Business Phone No.

---

CONTRACTOR'S Emergency Phone No. at  
which contractor can be reached at any time

---

---

---

Name, Title



**SECTION 00 52 13  
AGREEMENT FORM - PUBLIC  
WORKS CONTRACT**

**DIVISION 00**

**EXHIBIT A  
NOTICE INVITING SEALED BIDS**





**SECTION 00 52 13  
AGREEMENT FORM - PUBLIC  
WORKS CONTRACT**

**DIVISION 00**

**EXHIBIT B  
BID PROPOSAL**



**PERFORMANCE AND PAYMENT BONDS (LABOR AND MATERIALS)**

**1.01 PERFORMANCE BOND**

**KNOW ALL PERSONS BY THESE PRESENTS:**

**THAT WHEREAS**, the City of Goleta, (hereinafter referred to as "City") has awarded to \_\_\_\_\_, (hereinafter referred to as the "Contractor") an agreement for **Contract No.** \_\_\_\_\_, (hereinafter referred to as the "Project").

**WHEREAS**, the work to be performed by the Contractor is more particularly set forth in the Contract Documents for the Project dated \_\_\_\_\_, (hereinafter referred to as "Contract Documents"), the terms and conditions of which are expressly incorporated herein by reference; and

**WHEREAS**, the Contractor is required by said Contract Documents to perform the terms thereof and to furnish a bond for the faithful performance of said Contract Documents.

**NOW, THEREFORE**, we, \_\_\_\_\_, the undersigned Contractor and \_\_\_\_\_ as Surety, a corporation organized and duly authorized to transact business under the laws of the State of California, are held and firmly bound unto the City in the sum of \_\_\_\_\_ DOLLARS, (\$ \_\_\_\_\_), said sum being not less than one hundred percent (100%) of the total amount of the Contract, for which amount 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 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 Contract Documents and any alteration thereof made as therein provided, on its part, to be kept and performed at the time and in the manner therein specified, and in all respects according to their intent and meaning; and shall faithfully fulfill all obligations including the one (1) year guarantee of all materials and workmanship; and shall indemnify and save harmless the City, its officials, officers, employees, and authorized volunteers, as stipulated in said Contract Documents, then this obligation shall become null and void; otherwise it shall be and remain in full force and effect.

As a part of the obligation secured hereby and in addition to the face amount specified therefore, there shall be included costs and reasonable expenses and fees including reasonable attorney's fees, incurred by City in enforcing such obligation. As a condition precedent to the satisfactory completion of the Contract Documents, unless otherwise provided for in the Contract Documents, the above obligation shall hold good for a period of one (1) year after the acceptance of the work by City, during which time if Contractor shall fail to make full, complete, and satisfactory repair and replacements and totally protect the City from loss or damage resulting from or caused by defective materials or faulty workmanship. The obligations of Surety hereunder shall continue so long as any obligation of Contractor



**SECTION 00 61 13  
BOND FORMS**

**DIVISION 00**

remains. Nothing herein shall limit the City's rights or the Contractor or Surety's obligations under the Contract, law or equity, including, but not limited to, California Code of Civil Procedure Section 337.15. Whenever Contractor shall be, and is declared by the City to be, in default under the Contract Documents, the Surety shall remedy the default pursuant to the Contract Documents, or shall promptly, at the City's option:

- i. Take over and complete the Project in accordance with all terms and conditions in the Contract Documents; or
- ii. Obtain a bid or bids for completing the Project in accordance with all terms and conditions in the Contract Documents and upon determination by Surety of the lowest responsive and responsible bidder, arrange for a Contract between such bidder, the Surety and the City, and make available as work progresses sufficient funds to pay the cost of completion of the Project, less the balance of the contract price, including other costs and damages for which Surety may be liable. The term "balance of the contract price" as used in this paragraph shall mean the total amount payable to Contractor by the City under the Contract and any modification thereto, less any amount previously paid by the City to the Contractor and any other set offs pursuant to the Contract Documents.
- iii. Permit the City to complete the Project in any manner consistent with California law and make available as work progresses sufficient funds to pay the cost of completion of the Project, less the balance of the contract price, including other costs and damages for which Surety may be liable. The term "balance of the contract price" as used in this paragraph shall mean the total amount payable to Contractor by the City under the Contract and any modification thereto, less any amount previously paid by the City to the Contractor and any other set offs pursuant to the Contract Documents.

Surety expressly agrees that the City may reject any contractor or subcontractor which may be proposed by Surety in fulfillment of its obligations in the event of default by the Contractor.

Surety shall not utilize Contractor in completing the Project nor shall Surety accept a bid from Contractor for completion of the Project if the City, when declaring the Contractor in default, notifies Surety of the City's objection to Contractor's further participation in the completion of the Project.

The Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract Documents or to the Project to be performed thereunder shall in any way affect its obligations on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract Documents or to the Project.

By their signatures hereunder, Surety and Contractor hereby confirm under penalty of perjury that surety is an admitted surety insurer authorized to do business in the State of California.

**[REMAINDER OF PAGE LEFT INTENTIONALLY BLANK]**



**SECTION 00 61 13  
BOND FORMS**

**DIVISION 00**

**IN WITNESS WHEREOF**, we have hereunto set our hands and seals this \_\_\_\_\_  
\_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_\_.

(Corporate Seal)

\_\_\_\_\_  
Contractor/ Principal

By \_\_\_\_\_

Title \_\_\_\_\_

(Corporate Seal)

\_\_\_\_\_  
Surety

By \_\_\_\_\_

Attorney-in-Fact

(Attach Attorney-in-Fact Certificate)

Title \_\_\_\_\_

The rate of premium on this bond is \_\_\_\_\_ per thousand. The total amount  
of premium charges is \$\_\_\_\_\_.  
(The above must be filled in by corporate attorney.)

**THIS IS A REQUIRED FORM**

Any claims under this bond may be addressed to:

(Name and Address of Surety)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

(Name and Address of Agent or  
Representative for service of  
process in California, if different  
from above)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

(Telephone number of Surety and  
Agent or Representative for  
service of process in California)

\_\_\_\_\_



SECTION 00 61 13  
BOND FORMS

DIVISION 00

**Notary Acknowledgment**

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.

STATE OF CALIFORNIA  
COUNTY OF \_\_\_\_\_

On \_\_\_\_\_, 20\_\_\_\_, before me, \_\_\_\_\_, Notary Public, personally  
Date Name And Title Of Officer (e.g. "Jane Doe, Notary Public")  
appeared \_\_\_\_\_, who proved to me on the basis of satisfactory  
Name(s) of Signer(s)

evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Place Notary Seal Above

Signature of Notary Public

**OPTIONAL**

*Though the information below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent removal and reattachment of this form to another document.*

**CAPACITY CLAIMED BY SIGNER**

**DESCRIPTION OF ATTACHED DOCUMENT**

- ☐ Individual  
☐ Corporate Officer

- ☐ Partner(s)      ☐ Limited  
                                 ☐ General  
☐ Attorney-In-Fact  
☐ Trustee(s)  
☐ Guardian/Conservator  
☐ Other:

Signer is representing:  
Name Of Person(s) Or  
Entity(ies)

Title or Type of Document

Number of Pages

Date of Document

Signer(s) Other Than Named Above

NOTE: This acknowledgment is to be completed for Contractor/Principal.



SECTION 00 61 13  
BOND FORMS

DIVISION 00

**Notary Acknowledgment**

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STATE OF CALIFORNIA  
COUNTY OF \_\_\_\_\_

On \_\_\_\_\_, 20\_\_\_\_, before me, \_\_\_\_\_, Notary Public, personally  
Date Name And Title Of Officer (e.g. "Jane Doe, Notary Public")  
appeared \_\_\_\_\_, who proved to me on the basis of satisfactory  
Name(s) of Signer(s)

evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Place Notary Seal Above

Signature of Notary Public

**OPTIONAL**

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**CAPACITY CLAIMED BY SIGNER**

**DESCRIPTION OF ATTACHED DOCUMENT**

- ☐ Individual  
☐ Corporate Officer

- ☐ Partner(s) Title(s)  
☐ Limited  
☐ General  
☐ Attorney-In-Fact  
☐ Trustee(s)  
☐ Guardian/Conservator  
☐ Other:

Signer is representing:  
Name Of Person(s) Or  
Entity(ies)

Title or Type of Document

Number of Pages

Date of Document

Signer(s) Other Than Named Above

NOTE: This acknowledgment is to be completed for the Attorney-in-Fact. The Power-of-Attorney to local representatives of the bonding company must also be attached.

**END OF PERFORMANCE BOND**



## 1.02 PAYMENT BOND (LABOR AND MATERIALS)

### KNOW ALL PERSONS BY THESE PRESENTS:

**THAT WHEREAS**, the City of Goleta (hereinafter designated as the "City"), by action taken or a resolution passed \_\_\_\_\_, 20\_\_\_\_, has awarded to \_\_\_\_\_ hereinafter designated as the "Principal," a contract for the work described as follows: **Contract No.** \_\_\_\_\_ (the "Project"); and

**WHEREAS**, said Principal is required to furnish a bond in connection with said contract; providing that if said Principal or any of its Subcontractors shall fail to pay for any materials, provisions, provender, equipment, or other supplies used in, upon, for or about the performance of the work contracted to be done, or for any work or labor done thereon of any kind, or for amounts due under the Unemployment Insurance Code or for any amounts required to be deducted, withheld, and paid over to the Employment Development Department from the wages of employees of said Principal and its Subcontractors with respect to such work or labor the Surety on this bond will pay for the same to the extent hereinafter set forth.

**NOW THEREFORE**, we, the Principal and \_\_\_\_\_ as Surety, are held and firmly bound unto the City in the penal sum of \_\_\_\_\_ Dollars (\$\_\_\_\_\_) lawful money of the United States of America, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

**THE CONDITION OF THIS OBLIGATION IS SUCH** that if said Principal, his or its subcontractors, heirs, executors, administrators, successors or assigns, shall fail to pay any of the persons named in Civil Code Section 9100, fail to pay for any materials, provisions or other supplies, used in, upon, for or about the performance of the work contracted to be done, or for any work or labor thereon of any kind, 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 or Franchise Tax Board from the wages of employees of the contractor and his subcontractors pursuant to Revenue and Taxation Code Section 18663, with respect to such work and labor the Surety or Sureties will pay for the same, in an amount not exceeding the sum herein above specified, and also, in case suit is brought upon this bond, all litigation expenses incurred by the City in such suit, including reasonable attorneys' fees, court costs, expert witness fees and investigation expenses.

This bond shall inure to the benefit of any of the persons named in Civil Code Section 9100 so as to give a right of action to such persons or their assigns in any suit brought upon this bond.

It is further stipulated and agreed that the Surety on this bond shall not be exonerated or released from the obligation of this bond by any change, extension of time for performance, addition, alteration or modification in, to, or of any contract, plans, specifications, or agreement pertaining or relating to any scheme or work of improvement herein above described, or pertaining or relating to the furnishing of labor, materials, or equipment therefore, nor by any change or modification of any terms of payment or extension of the time for any payment



**SECTION 00 61 13  
BOND FORMS**

**DIVISION 00**

pertaining or relating to any scheme or work of improvement herein above described, nor by any rescission or attempted rescission or attempted rescission of the contract, agreement or bond, nor by any conditions precedent or subsequent in the bond attempting to limit the right of recovery of claimants otherwise entitled to recover under any such contract or agreement or under the bond, nor by any fraud practiced by any person other than the claimant seeking to recover on the bond and that this bond be construed most strongly against the Surety and in favor of all persons for whose benefit such bond is given, and under no circumstances shall Surety be released from liability to those for whose benefit such bond has been given, by reason of any breach of contract between the owner or City and original contractor or on the part of any obligee named in such bond, but the sole conditions of recovery shall be that claimant is a person described in Civil Code Section 9100, and has not been paid the full amount of his claim and that Surety does hereby waive notice of any such change, extension of time, addition, alteration or modification herein mentioned, including but not limited to the provisions of sections 2819 and 2845 of the California Civil Code.

By their signatures hereunder, Surety and Principal hereby confirm under penalty of perjury that surety is an admitted surety insurer authorized to do business in the State of California.

**IN WITNESS WHEREOF**, we have hereunto set our hands and seals this \_\_\_\_\_  
\_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_\_.

(Corporate Seal)

\_\_\_\_\_  
Contractor/ Principal

By \_\_\_\_\_

Title \_\_\_\_\_

(Corporate Seal)

\_\_\_\_\_  
Surety

By \_\_\_\_\_

Attorney-in-Fact

(Attach Attorney-in-Fact Certificate)

Title \_\_\_\_\_





SECTION 00 61 13  
BOND FORMS

DIVISION 00

**Notary Acknowledgment**

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STATE OF CALIFORNIA  
COUNTY OF \_\_\_\_\_

On \_\_\_\_\_, 20\_\_\_\_, before me, \_\_\_\_\_, Notary Public, personally  
Date Name And Title Of Officer (e.g. "Jane Doe, Notary Public")  
appeared \_\_\_\_\_, who proved to me on the basis of satisfactory  
Name(s) of Signer(s)

evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Place Notary Seal Above

Signature of Notary Public

**OPTIONAL**

*Though the information below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent removal and reattachment of this form to another document.*

**CAPACITY CLAIMED BY SIGNER**

**DESCRIPTION OF ATTACHED DOCUMENT**

- ☐ Individual  
☐ Corporate Officer

Title(s)		Title or Type of Document
<input type="checkbox"/> Partner(s)	<input type="checkbox"/> Limited	_____
	<input type="checkbox"/> General	_____
<input type="checkbox"/> Attorney-In-Fact		Number of Pages
<input type="checkbox"/> Trustee(s)		_____
<input type="checkbox"/> Guardian/Conservator		Date of Document
<input type="checkbox"/> Other:		_____
Signer is representing: Name Of Person(s) Or Entity(ies)		_____
_____		Signer(s) Other Than Named Above

NOTE: This acknowledgment is to be completed for Contractor/Principal.

### Notary Acknowledgment

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.

STATE OF CALIFORNIA  
COUNTY OF \_\_\_\_\_

On \_\_\_\_\_, 20\_\_\_\_, before me, \_\_\_\_\_, Notary Public, personally  
Date Name And Title Of Officer (e.g. "Jane Doe, Notary Public")  
appeared \_\_\_\_\_, who proved to me on the basis of satisfactory  
Name(s) of Signer(s)

evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Place Notary Seal Above

\_\_\_\_\_  
Signature of Notary Public

#### OPTIONAL

*Though the information below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent removal and reattachment of this form to another document.*

#### CAPACITY CLAIMED BY SIGNER

#### DESCRIPTION OF ATTACHED DOCUMENT

- ☐ Individual  
☐ Corporate Officer

- \_\_\_\_\_  
Title(s)  
☐ Partner(s) ☐ Limited  
☐ General  
☐ Attorney-In-Fact  
☐ Trustee(s)  
☐ Guardian/Conservator  
☐ Other:

Signer is representing:  
Name Of Person(s) Or  
Entity(ies)

\_\_\_\_\_  
Title or Type of Document

\_\_\_\_\_  
Number of Pages

\_\_\_\_\_  
Date of Document

\_\_\_\_\_  
Signer(s) Other Than Named Above

NOTE: This acknowledgment is to be completed for the Attorney-in-Fact. The Power-of-Attorney to local representatives of the bonding company must also be attached.

**END OF PAYMENT BOND**



**SECTION 00 63 25  
SUBSTITUTION REQUEST  
FORM - DURING  
CONSTRUCTION**

**DIVISION 00**

**SUBSTITUTION REQUEST FORM - DURING CONSTRUCTION**

To: City Project Manager, City of Goleta  
Project: Goleta Valley Library ADA, Safety, And Building Improvement (CIP 9130)

Contractor: \_\_\_\_\_ Substitution Request Number: \_\_\_\_\_

Specification Title: \_\_\_\_\_ Description: \_\_\_\_\_

Section: \_\_\_\_\_ Page: \_\_\_\_\_ Article/Paragraph: \_\_\_\_\_

Proposed Substitution: \_\_\_\_\_

Manufacturer: \_\_\_\_\_

Address: \_\_\_\_\_ Phone: \_\_\_\_\_

Trade Name: \_\_\_\_\_ Model No.: \_\_\_\_\_

Installer: \_\_\_\_\_ Address: \_\_\_\_\_ Phone: \_\_\_\_\_

History: ☐ New product ☐ 1-4 years old ☐ 5-10 years old ☐ More than 10 years old

Differences between proposed substitution and specified product:

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☐ Point-by-point comparative data attached — **REQUIRED BY A/E**

Reason for not providing specified item:

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**SECTION 00 63 25  
SUBSTITUTION REQUEST  
FORM - DURING  
CONSTRUCTION**

**DIVISION 00**

Similar Installation:

Project: \_\_\_\_\_ Architect: \_\_\_\_\_

Address: \_\_\_\_\_ Owner: \_\_\_\_\_

\_\_\_\_\_ Date Installed: \_\_\_\_\_

Proposed substitution affects other parts of Work: ☐ No ☐ Yes; explain \_\_\_\_\_

Savings to Owner for accepting substitution: \_\_\_\_\_ (\$ \_\_\_\_\_).

Proposed substitution changes Contract Time: ☐ No ☐ Yes [Add] [Deduct] \_\_\_\_\_ days.

Supporting Data Attached:

☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ \_\_\_\_\_

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

**SUBMITTED BY:**

The undersigned Contractor certifies that the function, appearance, and quality of the proposed substitution are equivalent or superior to those of the specified item.

\_\_\_\_\_  
Contractor Name Title



**SECTION 00 63 25  
SUBSTITUTION REQUEST  
FORM - DURING  
CONSTRUCTION**

**DIVISION 00**

\_\_\_\_\_  
Signature      Date

\_\_\_\_\_  
Address      City/State/Zip

\_\_\_\_\_  
Telephone      Email

Attachments: ☐

**A/E's REVIEW AND ACTION:**

- ☐ Approve Substitution - Make submittals in accordance with Specification Section 01 25 13 Substitution Procedures.
- ☐ Approve Substitution as noted - Make submittals in accordance with Specification Section 01 25 13 Substitution Procedures.
- ☐ Reject Substitution - Use specified materials.
- ☐ Substitution Request received too late - Use specified materials.

By: \_\_\_\_\_  
A/E Representative      Date

**OWNER'S REVIEW AND ACTION:**

- ☐ Substitution approved - Make submittals in accordance with Specification Section 01 60 00 Materials, Equipment, and Product Requirements. Prepare Change Order.
- ☐ Substitution approved as noted - Make submittals in accordance with Specification Section 01 60 00 Materials, Equipment, and Product Requirements. Prepare Change Order.
- ☐ Substitution rejected - Use specified materials.

By: \_\_\_\_\_  
City Representative      Date

Additional Comments:

☐ Contractor    ☐ Subcontractor    ☐ Supplier    ☐ Manufacturer    ☐ A/E

**END OF SECTION**

**SECTION 00 72 00  
GENERAL CONDITIONS**

**FORM OF GENERAL CONDITIONS**

**1.01 DEFINED TERMS**

Whenever used in the Contract Documents and printed with initial capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof. In addition to terms specifically defined below, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.

- A. **Act of God:** An earthquake of magnitude of 3.5 or higher on the Richter scale or a tidal wave.
- B. **Addenda:** Written or graphic instruments issued prior to the submission of Bids which clarify, correct, or change the Contract Documents.
- C. **Additional Work:** New or unforeseen work will be classified as "Additional Work" when the City's Representative determines that it is not covered by the Contract.
- D. **Applicable Laws:** The laws, statutes, ordinances, rules, codes, regulations, permits, and licenses of any kind, issued by local, state or federal governmental authorities or private authorities with jurisdiction (including utilities), to the extent they apply to the Work.
- E. **Architect:** Whenever not qualified, shall mean the City Architect of the City, acting either directly or through properly authorized agents, such agents acting severally within the scope of the particular duties entrusted to them. On all questions concerning the acceptance of materials, machinery, the classifications of material, the execution of work, conflicting interest of the contractors performing related work and the determination of costs, the decision of the Architect, duly authorized by the City, shall be binding and final upon both parties.
- F. **Architect of Record:** The individual, partnership, corporation, joint venture, or other legal entity as identified in the Special Conditions or any succeeding entity designated by the City.
- G. **Bid:** The offer or proposal of a Bidder submitted on the prescribed form setting forth the prices and other terms for the Work to be performed.
- H. **Bidder:** The individual or entity who submits a Bid directly to the City.
- I. **Caltrans Standards:** 2023 Editions of the California Department of Transportation Standard Plans and Specifications.
- J. **Change Order ("CO"):** A document that authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Contract, in accordance with the Contract Documents and in the form contained in the Contract Documents.
- K. **Change Order Request ("COR"):** A request made by the Contractor for an adjustment in the Contract Price and/or Contract Times as the result of a Contractor-claimed change to the Work. This term may also be referred to as a Change Order Proposal ("COP"), or Request for Change ("RFC").
- L. **City:** The City of Goleta.
- M. **City's Representative:** The individual or entity as identified in the Special Conditions to act as the City's Representative.
- N. **Claim:** A demand or assertion by the City or Contractor seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.



**SECTION 00 72 00  
GENERAL CONDITIONS**

**DIVISION 00**

- O. **Contract:** The entire integrated written agreement between the City and Contractor concerning the Work. "Contract" may be used interchangeably with "Agreement" in the Contract Documents. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral, and includes all Contract Documents.
- P. **Contract Documents:** The documents listed in Section 00 52 13, Article 5. Some documents provided by the City to the Bidders and Contractor, including but not limited to reports and drawings of subsurface and physical conditions, are not Contract Documents.
- Q. **Contract Price:** Amount to be paid by the City to the Contractor as full compensation for the performance of the Contract and completion of the Work, subject to any additions or deductions as provided in the Contract Documents, and including all applicable taxes and costs.
- R. **Contract Times:** The number of days or the dates stated in the Contract Documents to achieve defined Milestones, if any; and to complete the Work so that it is ready for final payment.
- S. **Contractor:** The individual or entity with which the City has contracted for performance of the Work.
- T. **Contractor's Designated On-Site Representative:** The Contractor's Designated On-Site Representative will be as identified in the General Conditions, and shall not be changed without prior written consent of the City.
- U. **Daily Rate:** The Daily Rate stipulated in the Contract Documents as full compensation to the Contractor due to the City's unreasonable delay to the Project that was not contemplated by the parties.
- V. **Day:** A calendar day of 24 hours measured from midnight to the next midnight.
- W. **Defective Work:** Work that is unsatisfactory, faulty, or deficient; or that does not conform to the Contract Documents; or that does not meet the requirements of any inspection, reference standard, test, or approval referenced in the Contract Documents.
- X. **Demobilization:** The complete dismantling and removal by the Contractor of all of the Contractor's temporary facilities, equipment, and personnel at the Site.
- Y. **Drawings:** That part of the Contract Documents prepared by of the Architect of Record which graphically shows the scope, extent, and character of the Work to be performed by Contractor. Shop Drawings and other Contractor submittals are not Drawings as so defined.
- Z. **Effective Date of the Contract:** The date indicated in the Contract on which it becomes effective, but if no such date is indicated, it means the date on which the Contract is signed and delivered by the last of the two parties to sign and deliver.
- AA. **Green Book:** The current edition of the Standard Specifications for Public Works Construction.
- BB. **Hazardous Waste:** The term "Hazardous Waste" shall have the meaning provided in Section 104 of the Solid Waste Disposal Act (42 U.S.C. § 6903) as amended from time to time or, as defined in Section 25117 of the Health and Safety Code, that is required to be removed to a class I, class II, or class III disposal site in accordance with provisions of existing law, whichever is more restrictive.
- CC. **Holiday:** City observed holidays occur on:
  - 1. New Year's Day - January 1 (Observed Monday if on Sunday, Friday if on Saturday)
  - 2. Martin Luther King Jr.'s Birthday
  - 3. President's Day – Third Monday in February
  - 4. Memorial Day - Last Monday in May
  - 5. Independence Day - July 4 (Observed Monday if on Sunday, Friday if on Saturday)
  - 6. Labor Day - First Monday in September
  - 7. Veterans Day - November 11 (Observed Monday if on Sunday, Friday if on Saturday)
  - 8. Thanksgiving Day - Fourth Thursday in November



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9. Day After Thanksgiving - Fourth Friday in November
  10. Christmas Eve: December 24
  11. Christmas Day: December 25
  12. If the holiday falls on a Saturday, the observed day is the preceding Friday. If the holiday falls on a Sunday, the observed day is the following Monday.
- DD. **Notice of Award:** The written notice by the City to the Successful Bidder stating that upon timely compliance by the Successful Bidder with the conditions precedent listed therein, the City will sign and deliver the Contract.
- EE. **Notice of Completion:** The form which may be executed by the City and recorded by the county where the Project is located constituting final acceptance of the Project.
- FF. **Notice to Proceed:** A written notice given by the City to Contractor fixing the date on which the Contractor may proceed with the Work and when Contract Times will commence to run.
- GG. **Project:** The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part.
- HH. **Recyclable Waste Materials:** Materials removed from the Site which are required to be diverted to a recycling center rather than an area landfill. Recyclable Waste Materials include asphalt, concrete, brick, concrete block, and rock.
- II. **Schedule of Submittals:** A schedule, prepared and maintained by Contractor, of required submittals and the time requirements to facilitate scheduled performance of related construction activities.
- JJ. **Shop Drawings:** All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.
- KK. **Specifications:** That part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable thereto.
- LL. **Stop Payment Notice:** A written notice as defined in Civil Code section 8044.
- MM. **Subcontractor:** An individual or entity other than a Contractor having a contract with any other entity than the City for performance of any portion of the Work at the Site.
- NN. **Submittal:** Written and graphic information and physical samples prepared and supplied by the Contractor demonstrating various portions of the Work.
- OO. **Successful Bidder:** The Bidder submitting a responsive Bid to whom the City makes an award.
- PP. **Supplier:** A manufacturer, fabricator, supplier, distributor, material man, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment used in the performance of the Work or to be incorporated in the Work.
- QQ. **Underground Facilities:** All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.
- RR. **Unit Price Work:** Work to be paid for on the basis of unit prices as provided by the Contractor in its bid or as adjusted in accordance with the Contract Documents.
- SS. **Warranty:** A written guarantee provided to the City by the Contractor that the Work will remain free of defects and suitable for its intended use for the period required by the Contract Documents or the longest period permitted by the law of this State, whichever is longer.



- TT. **Work:** The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.

## 1.02 CONTRACT DOCUMENTS

- A. **Contract Documents.** The Contract Documents are complementary, and what is called for by one shall be as binding as if called for by all.
- B. **Interpretations.** The Contract Documents are intended to be fully cooperative and complementary. If the Contractor observes that any documents are in conflict, the Contractor shall promptly notify the Architect in writing. In case of conflicts between the Contract Documents, the order of precedence shall be as follows:
1. Change Orders
  2. Addenda
  3. Special Conditions
  4. Technical Specifications
  5. Plans (Contract Drawings)
  6. Contract
  7. General Conditions
  8. Instructions to Bidders
  9. Notice Inviting Bids
  10. Contractor's Bid Forms
  11. Standard Plans and Specifications - 2023 California Department of Transportation
  12. Applicable Local Agency Standards and Specifications
  13. Standard Drawings
  14. Reference Documents
- C. With reference to the Drawings, the order of precedence shall be as follows:
1. Figures govern over scaled dimensions
  2. Detail drawings govern over general drawings
  3. Addenda or Change Order drawings govern over Contract Drawings
  4. Contract Drawings govern over Standard Drawings
  5. Contract Drawings govern over Shop Drawings
- D. **Conflicts in Contract Documents.** Notwithstanding the orders of precedence established above, in the event of conflicts, the higher standard, higher quality, and most expensive shall always apply.
- E. **Organization of Contract Documents.** Organization of the Contract Documents into divisions, sections, and articles, and arrangement of drawings shall not control the Contractor in dividing Project Work among subcontractors or in establishing the extent of Work to be performed by any trade.

## 1.03 PRECONSTRUCTION AND CONSTRUCTION COMMUNICATION

- A. Before any Work at the site is started, a conference attended by the City, Contractor, City's Representative, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to herein, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.



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- B. At this conference, the City and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit instructions, receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

**1.04 CONTRACT DOCUMENTS: COPIES & MAINTENANCE**

- A. Contractor will be furnished, free of charge, one (1) copy of the Contract Documents. Additional copies may be obtained at the cost of reproduction.
- B. Contractor shall maintain a clean, undamaged set of Contract Documents, including submittals, at the Project site.

**1.05 EXAMINATION OF DRAWINGS, SPECIFICATIONS, AND SITE OF WORK**

- A. **Examination of Contract Documents.** Before commencing any portion of the Work, Contractor shall again carefully examine all applicable Contract Documents, the Project site, and other information given to Contractor as to materials and methods of construction and other Project requirements. Contractor shall immediately notify the Architect of any potential error, inconsistency, ambiguity, conflict, or lack of detail or explanation. If Contractor performs, permits, or causes the performance of any Work which is in error, inconsistent or ambiguous, or not sufficiently detailed or explained, Contractor shall bear any and all resulting costs, including, without limitation, the cost of correction. In no case shall the Contractor or any subcontractor proceed with Work if uncertain as to the applicable requirements.
- B. **Additional Instructions.** After notification of any error, inconsistency, ambiguity, conflict, or lack of detail or explanation, the Architect will provide any required additional instructions, by means of drawings or other written direction, necessary for proper execution of Work.
- C. **Quality of Parts, Construction and Finish.** All parts of the Work shall be of the best quality of their respective kinds and the Contractor must use all diligence to inform itself fully as to the required construction and finish.
- D. **Contractor's Variation from Contract Document Requirements.** If it is found that the Contractor has varied from the requirements of the Contract Documents including the requirement to comply with all applicable laws, ordinances, rules and regulations, the Architect may at any time, before or after completion of the Work, order the improper Work removed, remade or replaced by the Contractor at the Contractor's expense.

**1.06 MOBILIZATION**

- A. When a bid item is included in the Bid Form for mobilization, the costs of Work in advance of construction operations and not directly attributable to any specific bid item will be included in the progress estimate ("Initial Mobilization"). When no bid item is provided for "Initial Mobilization," payment for such costs will be deemed to be included in the other items of the Work.
- B. Payment for Initial Mobilization based on the lump sum provided in the Bid Form, which shall constitute full compensation for all such Work. No payment for Initial Mobilization will be made until all of the listed items have been completed to the satisfaction of the Architect. The scope of the Work included under Initial Mobilization shall include, but shall not be limited to, the following principal items:
  - 1. Obtaining and paying for all bonds, insurance, and permits.
  - 2. Moving on to the Project site of all Contractor's plant and equipment required for the first month's operations.
  - 3. Installing temporary construction power, wiring, and lighting facilities, as applicable.
  - 4. Establishing fire protection system, as applicable.
  - 5. Developing and installing a construction water supply, if applicable.



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6. Providing and maintaining the field office trailers for the Contractor, if necessary, and the Architect (if specified), complete, with all specified furnishings and utility services.
7. Providing on-site sanitary facilities and potable water facilities as specified per Cal-OSHA and these Contract Documents.
8. Furnishing, installing, and maintaining all storage buildings or sheds required for temporary storage of products, equipment, or materials that have not yet been installed in the Work. All such storage shall meet manufacturer's specified storage requirements, and the specific provisions of the specifications, including temperature and humidity control, if recommended by the manufacturer, and for all security.
9. Arranging for and erection of Contractor's work and storage yard.
10. Posting all OSHA required notices and establishment of safety programs per Cal- OSHA.
11. Full-time presence of Contractor's superintendent at the job site as required herein.
12. Submittal of Construction Schedule as required by the Contract Documents.

**1.07 EXISTENCE OF UTILITIES AT THE WORK SITE**

- A. The City has endeavored to determine the existence of utilities at the Project site from the records of the owners of known utilities in the vicinity of the Project. The positions of these utilities as derived from such records are shown on the Plans.
- B. Unless indicated otherwise on the Plans and Specifications, no excavations were made to verify the locations shown for underground utilities. The service connections to these utilities are not shown on the Plans. Water service connections may be shown on the Plans showing general locations of such connections. It shall be the responsibility of the Contractor to determine the exact location of all service connections. The Contractor shall make its own investigations, including exploratory excavations, to determine the locations and type of service connections, prior to commencing Work which could result in damage to such utilities. The Contractor shall immediately notify the City in writing of any utility discovered in a different position than shown on the Plans or which is not shown on the Plans.
- C. If applicable, all water meters, water valves, fire hydrants, electrical utility vaults, telephone vaults, gas utility valves, and other subsurface structures shall be relocated or adjusted to final grade by the Contractor. Locations of existing utilities shown on the Plans are approximate and may not be complete. The Contractor shall be responsible for coordinating its Work with all utility companies during the construction of the Work.
- D. Notwithstanding the above, pursuant to section 4215 of the Government Code, the City has the responsibility to identify, with reasonable accuracy, main or trunkline facilities on the plans and specifications. In the event that main or trunkline utility facilities are not identified with reasonable accuracy in the plans and specifications made a part of the invitation for Bids, the City shall assume the responsibility for their timely removal, relocation, or protection.
- E. Contractor, except in an emergency, shall contact the appropriate regional notification center, **California Underground Service Alert** at 811 or 1-800-227-2600 or on-line at [www.digalert.org](http://www.digalert.org) at least two working days prior to commencing any excavation if the excavation will be performed in an area which is known, or reasonably should be known, to contain subsurface installations other than the underground facilities owned or operated by the City, and obtain an inquiry identification number from that notification center. No excavation shall be commenced or carried out by the Contractor unless such an inquiry identification number has been assigned to the Contractor or any subcontractor of the Contractor and the City has been given the identification number by the Contractor.

### 1.08 SOILS INVESTIGATIONS

- A. Reports and Drawings. The Special Conditions identify:
1. Those reports known to the City of explorations and tests of subsurface conditions at or contiguous to the site; and
  2. Those drawings known to the City of physical conditions relating to existing surface or subsurface structures at the site (except Underground Facilities).
- B. Limited Reliance by Contractor on Technical Data Authorized. Contractor may rely upon the accuracy of the "technical data" contained in such reports and drawings, which were expressly not created or obtained to evaluate or assist in the evaluation of constructability, and are not Contract Documents. Contractor shall make its own interpretation of the "technical data" and shall be solely responsible for any such interpretations. Except for reliance on the accuracy of such "technical data," Contractor may not rely upon or make any claim against the City, City's Representative, or Architect of Record, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:
1. The completeness of such reports and drawings for Contractor's purposes, including without limitation any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or
  2. Other data, interpretations, opinions, conclusions and information contained in such reports or shown or indicated in such drawings; or
  3. Any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions, or information

### 1.09 CONTRACTOR'S SUPERVISION

- A. Contractor shall continuously keep at the Project site, a competent and experienced full-time Project superintendent acceptable to the City. Superintendent must be able to proficiently speak, read and write in English and shall have the authority to make decisions on behalf of the Contractor. Contractor shall continuously provide efficient supervision of the Project.

### 1.10 WORKERS

- A. Contractor shall at all times enforce strict discipline and good order among its employees. Contractor shall not employ on the Project any unfit person or any one not skilled in the Work assigned to him or her.
- B. Any person in the employ of the Contractor whom the City may deem incompetent or unfit shall be dismissed from the Work and shall not be employed on this Project.

### 1.11 INDEPENDENT CONTRACTORS

- A. Contractor shall be an independent contractor for the City and not an employee. Contractor understands and agrees that it and all of its employees shall not be considered officers, employees, or agents of City and are not entitled to benefits of any kind normally provided employees of City, including but not limited to, state unemployment compensation or workers' compensation. Contractor assumes full responsibility for the acts and omissions of its employees or agents related to the Work.



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**1.12 SUBCONTRACTS**

- A. Contractor agrees to bind every subcontractor to the terms of the Contract Documents as far as such terms are applicable to subcontractor's portion of the Work. Contractor shall be as fully responsible to the City for the acts and omissions of its subcontractors and of persons either directly or indirectly employed by its subcontractors, as Contractor is for acts and omissions of persons directly employed by Contractor. Nothing contained in these Contract Documents shall create any contractual relationship between any subcontractor and the City.
- B. The City reserves the right to accept all subcontractors. The City's acceptance of any subcontractor under this Contract shall not in any way relieve Contractor of its obligations in the Contract Documents.
- C. Prior to substituting any subcontractor listed in the Bid Forms, Contractor must comply with the requirements of the Subletting and Subcontracting Fair Practices Act pursuant to California Public Contract Code section 4100 et seq.

**1.13 VERIFICATION OF EMPLOYMENT ELIGIBILITY**

- A. By executing this Contract, Contractor verifies that it fully complies with all requirements and restrictions of state and federal law respecting the employment of undocumented aliens, including, but not limited to, the Immigration Reform and Control Act of 1986, as may be amended from time to time, and shall require all subcontractors, sub-subcontractors and consultants to comply with the same. Each person executing this Contract on behalf of Contractor verifies that he or she is a duly authorized officer of Contractor and that any of the following shall be grounds for the City to terminate the Contract for cause: (1) failure of the Contractor or its subcontractors, sub-subcontractors or consultants to meet any of the requirements provided for in this Section; (2) any misrepresentation or material omission concerning compliance with such requirements; or (3) failure to immediately remove from the Work any person found not to be in compliance with such requirements.

**1.14 REQUESTS FOR SUBSTITUTION**

- A. For the purposes of this provision, the term "substitution" shall mean the substitution of any material, method or service substantially equal to or better in every respect to that indicated in the Standard Specifications or otherwise referenced herein.
- B. Pursuant to Public Contract Code section 3400(b), the City may make a finding that is described in the Notice Inviting Bids that designates certain products, things, or services by specific brand or trade name.
- C. Unless specifically designated in the Special Conditions, whenever any material, process, or article is indicated or specified by grade, patent, or proprietary name or by name of manufacturer, such specifications shall be deemed to be used for the purpose of facilitating the description of the material, process, or article desired and shall be deemed to be followed by the words "or equal." Contractor may, unless otherwise stated, offer for substitution any material, process, or article which may be substantially equal to or better in every respect to that so indicated or specified in the Contract Documents. However, the City has adopted uniform standards for certain materials, processes, and articles.

- D. The Contractor shall submit substitution requests, together with substantiating data, for substitution of any "or equal" material, process, or article during the bidding phase. Refer to the Instruction to Bidders for specific deadlines. Provisions regarding submission of substitution requests shall not in any way authorize an extension of time for the performance of this Contract. If a substitution request is rejected by the City, the Contractor shall provide the material, method or service specified herein. The City shall not be responsible for any costs incurred by the Contractor associated with substitution requests. The burden of proof as to the equality of any material, process, or article shall rest with the Contractor. The Architect has the complete and sole discretion to determine if a material, process, or article is substantially equal to or better than that specified and to approve or reject all substitution requests.
- E. Substantiating data as described above shall include, at a minimum, the following information:
  - 1. A signed affidavit from the Contractor stating that the material, process, or article proposed as a substitution is substantially equal to or better than that specified in every way except as may be listed on the affidavit.
  - 2. Illustrations, specifications, catalog cut sheets, and any other relevant data required to prove that the material, process, or article is substantially equal to or better than that specified.
  - 3. A statement of the cost implications of the substitution being requested, indicating whether and why the proposed substitution will reduce or increase the amount of the contract.
  - 4. Information detailing the durability and lifecycle costs of the proposed substitution.
- F. Failure to submit all the required substantiating data detailed above in a timely manner so that the substitution request can be adequately reviewed may result in rejection of the substitution request. The Architect is not obligated to review multiple submittals related to the same substitution request resulting from the Contractor's failure to initially submit a complete package.
- G. Time limitations within this Section shall be strictly complied with and in no case will an extension of time for completion of the contract be granted because of Contractor's failure to provide substitution requests at the time and in the manner described herein.
- H. The Contractor shall bear the costs of all City work, including costs incurred by Design Professionals, associated with the review of substitution requests. Review of non-conforming work proposed after award shall be considered a substitution request.
- I. If substitution requests approved by the Architect require that Contractor furnish materials, methods or services more expensive than that specified, the increased costs shall be borne by Contractor.

#### **1.15 SHOP DRAWINGS**

- A. Contractor shall check and verify all field measurements and shall submit with such promptness as to provide adequate time for review and cause no delay in its own Work or in that of any other contractor, subcontractor, or worker on the Project copies of all shop drawings, calculations, schedules, and materials list, and all other provisions required by the Contract Documents. Contractor shall sign all submittals affirming that submittals have been reviewed and approved by Contractor prior to submission to Architect. Each signed submittal shall affirm that the submittal meets all the requirements of the Contract Documents except as specifically and clearly noted and listed on the transmittal letter of the submittal.



- B. Contractor shall make any corrections required by the Architect, and file with the Architect corrected copies each, and furnish such other copies as may be needed for completion of the Work. Architect's acceptance of shop drawings shall not relieve Contractor from responsibility for deviations from the Contract Documents unless Contractor has, in writing, called Architect's attention to such deviations at time of submission and has secured the Architect's written acceptance. Architect's acceptance of shop drawings shall not relieve Contractor from responsibility for errors in shop drawings.

**1.16 SUBMITTALS**

- A. Contractor shall furnish to the Architect for approval, prior to purchasing or commencing any Work, a log of all samples, material lists and certifications, mix designs, schedules, and other submittals, as required in the Contract Documents. The log shall indicate whether samples will be provided in accordance with other provisions of this Contract.
- B. Contractor will provide samples and submittals, together with catalogs and supporting data required by the Architect, to the Architect within a reasonable time period to provide for adequate review and avoid delays in the Work.
- C. These requirements shall not authorize any extension of time for performance of this Contract. Architect will check and approve such samples, but only for conformance with design concept of work and for compliance with information given in the Contract Documents. Work shall be in accordance with approved samples and submittals.

**1.17 MATERIALS**

- A. Except as otherwise specifically stated in the Contract Documents, Contractor shall provide and pay for all materials, labor, tools, equipment, lights, power, transportation, superintendence, temporary constructions of every nature, and all other services and facilities of every nature whatsoever necessary to execute and complete this Contract within specified time.
- B. Unless otherwise specified, all materials shall be new and the best of their respective kinds and grades as noted and/or specified, and workmanship shall be of good quality.
- C. Materials shall be furnished in ample quantities and at such times as to ensure uninterrupted progress of the Work and shall be stored properly and protected as required by the Contract Documents. Contractor shall be entirely responsible for damage or loss by weather or other causes to materials or Work.
- D. No materials, supplies, or equipment for Work under this Contract shall be purchased subject to any chattel mortgage or under a conditional sale or other agreement by which an interest therein or in any part thereof is retained by the seller or supplier. Contractor warrants good title to all material, supplies, and equipment installed or incorporated in the Work and agrees upon completion of all work to deliver the Project, to the City free from any claims, liens, or charges.
- E. Materials shall be stored on the Project site in such manner so as not to interfere with any operations of the City or any independent contractor.
- F. Contractor shall verify all measurements, dimensions, elevations, and quantities before ordering any materials or performing any Work, and the City shall not be liable for Contractor's failure to do so. No additional compensation, over and above payment for the actual quantities at the prices set out in the Bid Form, will be allowed because of differences between actual measurements, dimension, elevations and quantities and those indicated on the Plans and in the Specifications. Any difference therein shall be submitted to the Architect for consideration before proceeding with the Work.

### 1.18 PERMITS AND LICENSES

- A. City will apply and pay for the review of necessary encroachment permits for Work within the public rights-of-way. Contractor shall obtain all other necessary permits and licenses for the construction of the Project and shall pay all fees required by law and shall comply with all laws, ordinances, rules and regulations relating to the Work and to the preservation of public health and safety. Before acceptance of the Project, the Contractor shall submit all licenses, permits, certificates of inspection and required approvals to the City.
- B. The Contractors Bid contains the Contractor's cost of developing traffic control designs and submitting for permits and implementation of traffic control. This allowance is specifically intended to account for the cost of traffic control permits and construction inspection fees charged by a Local Agency of Jurisdiction only. No other costs payable by Contractor to the Agency of Jurisdiction are included within the allowance. Payment by City to Contractor under the Permit and Inspection Allowance Bid Item shall be made on actual cost receipts only and in accordance with the provisions of these specifications. The City will waive all encroachment permits fees for the Contractor.

### 1.19 TRENCHES

- A. **Trenches Five Feet or More in Depth.** Contractor shall submit to the Architect at the preconstruction meeting, a detailed plan showing the design of shoring, bracing, sloping or other provisions to be made for worker protection from hazards of caving ground during the excavation of any trench or trenches five feet or more in depth. If such plan varies from shoring system standards established by the Construction Safety Orders of the California Code of Regulations, Department of Industrial Relations, the plan shall be prepared by a California registered civil or structural Architect. The plan shall not be less effective than the shoring, bracing, sloping, or other provisions of the Construction Safety Orders, as defined in the California Code of Regulations. The Contractor shall designate in writing the "competent person" as defined in Title 8, California Code of Regulations, who shall be present at the Work Site each day that trenching/excavation is in progress. The "competent person" shall prepare and provide daily trenching/excavation inspection reports to the Architect. Contractor shall also submit a copy of its annual California Occupational Safety and Health Administration (Cal/OSHA) trench/excavation permit.
- B. **Excavations Deeper than Four Feet.** If the Work involves excavating trenches or other excavations that extend deeper than four feet below the surface, Contractor shall promptly, and before the excavation is further disturbed, notify the City in writing of any of the following conditions:
  - 1. Material that the Contractor believes may be material that is hazardous waste, as defined in section 25117 of the Health and Safety Code, that is required to be removed to a Class I, Class II, or Class III disposal site in accordance with provisions of existing law.
  - 2. Subsurface or latent physical conditions at the site differing from those indicated.
  - 3. Unknown physical conditions at the site of any unusual nature, different materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract.The City shall promptly investigate the conditions, and if it finds that the conditions do so materially differ, or do involve hazardous waste, and cause a decrease or increase in Contractor's cost of, or the time required for, performance of any part of the Work, shall issue a change order under the procedures described in the Contract Documents.





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In the event that a dispute arises between the City and the Contractor as to whether the conditions materially differ, or involve hazardous waste, or cause a decrease or increase in the Contractor's cost of, or time required for, performance of any part of the Work, the Contractor shall not be excused from any scheduled completion date provided for by the Contract, but shall proceed with all Work to be performed under the Contract. Contractor shall retain any and all rights provided either by contract or by law which pertain to the resolution of disputes and protests between the parties.

**1.20 TRAFFIC CONTROL**

- A. Traffic control plan(s) for the Work may be required by the Agency(s) of Jurisdiction. Traffic control plans, if required, shall be prepared at Contractor's expense, and traffic control shall be performed at Contractor's expense in accordance with the requirements of the Agency(s) of Jurisdiction. The Permit and Inspection Allowance included within the Bid Form includes the cost of required traffic control permit(s) and construction inspection by the Agency(s) of Jurisdiction only. The Permit and Inspection Allowance does not include costs for preparation of any required traffic control plans, implementation of any traffic control requirements or for any traffic signal services that may be required. Costs for traffic control plans, implementation of traffic control, or traffic signal services required by the Agency(s) of Jurisdiction shall be included in the Contractor's Bid.
- B. All warning signs and safety devices used by the Contractor to perform the Work shall conform to the requirements contained in the State of California, Department of Transportation's current edition of "Manual of Traffic Controls for Construction and Maintenance Work Zones" or to the requirements of the local agency. The Contractor shall also be responsible for all traffic control required by the agency having jurisdiction over the project on the intersecting streets. Contractor must submit a traffic control plan to the agency having jurisdiction over the project for approval prior to starting work.
- C. The Contractor's representative on the site responsible for traffic control shall produce evidence that he/she has completed training acceptable to the California Department of Transportation for safety through construction zones. All of the streets in which the Work will occur shall remain open to traffic and one lane of traffic maintained at all times unless otherwise directed by the agency of jurisdiction. Businesses and residences adjacent to the Work shall be notified forty-eight (48) hours in advance of closing of driveways. The Contractor shall make every effort to minimize the amount of public parking temporarily eliminated due to construction in areas fronting businesses. No stockpiles of pipe or other material will be allowed in traveled right-of- ways after working hours unless otherwise approved by the Architect.

**1.21 DIVERSION OF RECYCLABLE WASTE MATERIALS**

- A. In compliance with the City's waste reduction and recycling efforts, including [Goleta Municipal Code Chapter 8.10](#), Contractor shall divert all Recyclable Waste Materials to appropriate recycling centers as required for compliance with the local jurisdiction's waste diversion ordinances. Contractor will be required to submit weight tickets and written proof of diversion with its monthly progress payment requests. Contractor shall complete and execute any certification forms, including, but not limited to, *Post Construction Waste Reduction and Recycling Summary Report (Exhibit B)*, required by City or other applicable agencies to document Contractor's compliance with these diversion requirements. All costs incurred for these waste diversion efforts shall be the responsibility of the Contractor.

**1.22 REMOVAL OF HAZARDOUS MATERIALS**

- A. Should Contractor encounter material reasonably believed to be polychlorinated biphenyl (PCB) or other toxic wastes and hazardous materials which have not been rendered harmless at the Project site, the Contractor shall immediately stop work at the affected Project site and shall report the condition to the City in writing. The City shall contract for any services required to directly remove and/or abate PCBs and other toxic wastes and hazardous materials, if required by the Project site(s), and shall not require the Contractor to subcontract for such services. The Work in the affected area shall not thereafter be resumed except by written agreement of the City and Contractor.

**1.23 SANITARY FACILITIES**

- A. Contractor shall provide sanitary temporary toilet buildings and hand washing facilities for the use of all workers. All toilets and hand washing facilities shall comply with all applicable federal, state and local laws, codes, ordinances, and regulations. Toilets shall be kept supplied with toilet paper and shall have workable door fasteners. Toilets and hand washing facilities shall be serviced no less than once weekly and shall be present in a quantity of not less than as required by Cal/OSHA regulations. The toilets and hand washing facilities shall be maintained in a sanitary condition at all times. Use of toilet and hand washing facilities in the Work under construction shall not be permitted. Any other Sanitary Facilities required by Cal/OSHA shall be the responsibility of the Contractor.

**1.24 AIR AND WATER POLLUTION CONTROL**

- A. Contractor shall comply with all air pollution control rules, regulations, ordinances and statutes. All containers of paint, thinner, curing compound, solvent or liquid asphalt shall be labeled to indicate that the contents fully comply with the applicable material requirements.

**1.25 LAYOUT AND FIELD ENGINEERING**

- A. All field engineering required for laying out the Work and establishing grades for earthwork operations shall be furnished by the Contractor at its expense.

**1.26 TESTS AND INSPECTIONS**

- A. If the Contract Documents, the Architect, or any instructions, laws, ordinances, or public authority requires any part of the Work to be tested or Approved, Contractor shall provide the Architect at least two (2) working days' notice of its readiness for observation or inspection. If inspection is by a public authority other than the City, Contractor shall promptly inform the City of the date fixed for such inspection. Required certificates of inspection (or similar) shall be secured by Contractor. Costs for City testing and City inspection shall be paid by the City. Costs of tests for Work found not to be in compliance shall be paid by the Contractor.
- B. If any Work is done or covered up without the required testing or approval, the Contractor shall uncover or deconstruct the Work, and the Work shall be redone after completion of the testing at the Contractor's cost in compliance with the Contract Documents.
- C. Where inspection and testing are to be conducted by an independent laboratory or agency, materials or samples of materials to be inspected or tested shall be selected by such laboratory or agency, or by the City, and not by Contractor. All tests or inspections of materials shall be made in accordance with the commonly recognized standards of national organizations.
- D. In advance of manufacture of materials to be supplied by Contractor which must be tested or inspected, Contractor shall notify the City so that the City may arrange for testing at the source of supply. Any materials which have not satisfactorily passed such testing and inspection shall not be incorporated into the Work.



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- E. If the manufacture of materials to be inspected or tested will occur in a plant or location greater than sixty (60) miles from the City, the Contractor shall pay for any excessive or unusual costs associated with such testing or inspection, including but not limited to excessive travel time, standby time and required lodging.
- F. Reexamination of Work may be ordered by the City. If so ordered, Work must be uncovered or deconstructed by Contractor. If Work is found to be in accordance with the Contract Documents, the City shall pay the costs of reexamination and reconstruction. If such work is found not to be in accordance with the Contract Documents, Contractor shall pay all costs.

**1.27 PROTECTION OF WORK AND PROPERTY**

- A. The Contractor shall be responsible for all damages to persons or property that occurs as a result of the Work. Contractor shall be responsible for the proper care and protection of all materials delivered and Work performed until completion and final Acceptance by the City. All Work shall be solely at the Contractor's risk. Contractor shall adequately protect adjacent property from settlement or loss of lateral support as necessary. Contractor shall comply with all applicable safety laws and building codes to prevent accidents or injury to persons on, about, or adjacent to the Project site where Work is being performed. Contractor shall erect and properly maintain at all times, as required by field conditions and progress of work, all necessary safeguards, signs, barriers, lights, and watchmen for protection of workers and the public, and shall post danger signs warning against hazards created in the course of construction.
- B. In an emergency affecting safety of life or of work or of adjoining property, Contractor, without special instruction or authorization from the Architect, is hereby permitted to act to prevent such threatened loss or injury; and Contractor shall so act, without appeal, if so authorized or instructed by the Architect or the City. Any compensation claimed by Contractor on account of emergency work shall be determined by and agreed upon by the City and the Contractor.

**1.28 CONTRACTOR'S MEANS AND METHODS**

- A. Contractor is solely responsible for the means and methods utilized to perform the Work. In no case shall the Contractor's means and methods deviate from commonly used industry standards.

**1.29 AUTHORIZED REPRESENTATIVES**

- A. The City shall designate representatives, who shall have the right to be present at the Project site at all times. The City may designate an inspector who shall have the right to observe all of the Contractor's Work. The inspector shall not be responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents. Contractor shall provide safe and proper facilities for such access.

**1.30 HOURS OF WORK**

- A. As provided in Article 3 (commencing at section 1810), Chapter 1, Part 7, Division 2 of the Labor Code, Contractor stipulates that eight (8) hours of labor shall constitute a legal day's work. The time of service of any worker employed at any time by the Contractor or by any subcontractor on any subcontract under this Contract upon the Work or upon any part of the Work contemplated by this Contract is limited and restricted to eight (8) hours during any one calendar day and 40 hours during any one calendar week, except as hereinafter provided. Notwithstanding the provisions herein above set forth, work performed by employees of Contractor in excess of eight (8) hours per day, and 40 hours during any one week, shall be permitted upon this public work upon compensation for all hours worked in excess of eight (8) hours per day at not less than one and one-half times the basic rate of pay.



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- B. The Contractor and every subcontractor shall keep an accurate record showing the name of and actual hours worked each calendar day and each calendar week by each worker employed in connection with the Work or any part of the Work contemplated by this Contract. The record shall be kept open at all reasonable hours to the inspection of the City and to the Division of Labor Law Enforcement, Department of Industrial Relations of the State of California.
- C. The Contractor shall pay to the City a penalty of twenty-five dollars (\$25.00) for each worker employed in the execution of this Contract by the Contractor or by any subcontractor for each calendar day during which such worker is required or permitted to work more than eight (8) hours in any calendar day and 40 hours in any one calendar week in violation of the provisions of Article 3 (commencing at section 1810), Chapter 1, Part 7, Division 2 of the Labor Code.
- D. Any work necessary to be performed after regular working hours, or on Saturdays and Sundays or other holidays, shall be performed without additional expense to the City.
- E. City will provide inspection during normal working hours from 8:00 a.m. to 3:30 p.m. Monday through Thursday. Inspection before or after this time will be charged to the Contractor as reimbursable inspection time. Inspections on weekends requires two days' notice for review and approval. Upon written request and approval, the 8.5 hour working day may be changed to other limits subject to city/county ordinance.
- F. It shall be unlawful for any person to operate, permit, use, or cause to operate any of the following at the Project site, other than between the hours of 7:00 a.m. to 5:00 p.m., Monday through Friday, with no Work allowed on the City-observed holidays, unless otherwise approved by the City:
  - 1. Powered Vehicles
  - 2. Construction Equipment
  - 3. Loading and Unloading Vehicles
  - 4. Domestic Power Tools

**1.31 PAYROLL RECORDS; LABOR COMPLIANCE**

- A. Pursuant to Labor Code section 1776, Contractor and all subcontractors shall maintain weekly certified payroll records, 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 them in connection with the Work under this Contract. Contractor shall certify under penalty of perjury that records maintained and submitted by Contractor are true and accurate. Contractor shall also require subcontractor(s) to certify weekly payroll records under penalty of perjury.
- B. In accordance with Labor Code section 1771.4, the Contractor and each subcontractor shall furnish the certified payroll records directly to the Department of Industrial Relations ("DIR") on the specified interval and format prescribed by the DIR, which may include electronic submission. Contractor shall comply with all requirements and regulations from the DIR relating to labor compliance monitoring and enforcement. The requirement to submit certified payroll records directly to the Labor Commissioner under Labor Code section 1771.4 shall not apply to work performed on a public works project that is exempt pursuant to the small project exemption specified in Labor Code Section 1771.4.



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- C. Any stop orders issued by the Department of Industrial Relations against Contractor or any subcontractor that affect Contractor's performance of Work, including any delay, shall be Contractor's sole responsibility. Any delay arising out of or resulting from such stop orders shall be considered Contractor caused delay subject to any applicable liquidated damages and shall not be compensable by the City. Contractor shall defend, indemnify and hold the City, its officials, officers, employees and agents free and harmless from any claim or liability arising out of stop orders issued by the Department of Industrial Relations against Contractor or any subcontractor.
- D. The payroll records described herein shall be certified and submitted by the Contractor at a time designated by the City. The Contractor shall also provide the following:
  - 1. A certified copy of the employee's payroll records shall be made available for inspection or furnished to such employee or his or her authorized representative on request.
  - 2. A certified copy of all payroll records described herein shall be made available for inspection or furnished upon request of the DIR.
- E. Unless submitted electronically, the certified payroll records shall be on forms provided by the Division of Labor Standards Enforcement ("DLSE") of the DIR or shall contain the same information as the forms provided by the DLSE.
- F. Any copy of records made available for inspection as copies and furnished upon request to the public or any public agency, the City, the Division of Apprenticeship Standards or the Division of Labor Standards Enforcement shall be marked or obliterated in such a manner as to prevent disclosure of an individual's name, address and social security number. The name and address of the Contractor awarded the Contract or performing the contract shall not be marked or obliterated.
- G. In the event of noncompliance with the requirements of this Section, the Contractor shall have ten (10) calendar days in which to comply subsequent to receipt of written notice specifying in what respects the Contractor must comply with this Section. Should noncompliance still be evident after such 10-day period, the Contractor shall pay a penalty of one hundred dollars (\$100.00) to the City for each calendar day, or portion thereof, for each worker, until strict compliance is effectuated. Upon the request of the Division of Apprenticeship Standards or the Division of Labor Standards Enforcement, such penalties shall be withheld from progress payment then due.
- H. The responsibility for compliance with this Section shall rest upon the Contractor.



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**1.32 PREVAILING RATES OF WAGES**

- A. The Contractor is aware of the requirements of Labor Code sections 1720 *et seq.* and 1770 *et seq.*, as well as California Code of Regulations, Title 8, Section 16000 *et seq.* ("Prevailing Wage Laws"), which require the payment of prevailing wage rates and the performance of other requirements on certain "public works" and "maintenance" projects. Since this Project involves an applicable "public works" or "maintenance" project, as defined by the Prevailing Wage Laws, and since the total compensation is \$1,000 or more, Contractor agrees to fully comply with such Prevailing Wage Laws. The Contractor shall obtain a copy of the prevailing rates of per diem wages at the commencement of this Contract from the website of the Division of Labor Statistics and Research of the Department of Industrial Relations located at [www.dir.ca.gov](http://www.dir.ca.gov). In the alternative, the Contractor may view a copy of the prevailing rate of per diem wages which are on file at the City's Engineering Office and shall be made available to interested parties upon request. Contractor shall make copies of the prevailing rates of per diem wages for each craft, classification, or type of worker needed to perform work on the Project available to interested parties upon request, and shall post copies at the Contractor's principal place of business and at the Project site. Contractor shall defend, indemnify and hold the City, its officials, officers, employees and authorized volunteers free and harmless from any claims, liabilities, costs, penalties or interest arising out of any failure or allege failure to comply with the Prevailing Wage Laws. The Contractor shall forfeit as a penalty to the City not more than Two Hundred Dollars (\$200.00), pursuant to Labor Code section 1775, for each calendar day, or portion thereof, for each worker paid less than the prevailing wage rate as determined by the Director of the Department of Industrial Relations for such work or craft in which such worker is employed for any public work done under the Contract by it or by any subcontractor under it. The difference between such prevailing wage rate and the amount paid to each worker for each calendar day or portion thereof, for which each worker was paid less than the prevailing wage rate, shall be paid to each worker by the Contractor.
- B. Contractor shall post, at appropriate conspicuous points on the Project site, a schedule showing all determined general prevailing wage rates and all authorized deductions, if any, from unpaid wages actually earned.

**1.33 PUBLIC WORKS CONTRACTOR REGISTRATION**

- A. Pursuant to Labor Code sections 1725.5 and 1771.1, the Contractor and its subcontractors must be registered with the Department of Industrial Relations prior to the execution of a contract to perform public works. By entering into this Contract, Contractor represents that it is aware of the registration requirement and is currently registered with the DIR. Contractor shall maintain a current registration for the duration of the Project. Contractor shall further include the requirements of Labor Code sections 1725.5 and 1771.1 in any subcontract and ensure that all subcontractors are registered at the time this Contract is entered into and maintain registration for the duration of the Project. Notwithstanding the foregoing, the contractor registration requirements mandated by Labor Code Sections 1725.5 and 1771.1 shall not apply to work performed on a public works project that is exempt pursuant to the small project exemption specified in Labor Code Sections 1725.5 and 1771.1.

**1.34 EMPLOYMENT OF APPRENTICES**

- A. Contractor and all subcontractors shall comply with the requirements of Labor Code sections 1777.5 and 1777.6 in the employment of apprentices.



- B. Information relative to apprenticeship standards, wage schedules, and other requirements may be obtained from the Director of Industrial Relations, ex officio the Administrator of Apprenticeship, San Francisco, California, or from the Division of Apprenticeship Standards and its branch offices.
- C. Knowing violations of Labor Code section 1777.5 will result in forfeiture not to exceed one hundred dollars (\$100.00) for each calendar day of non-compliance pursuant to Labor Code section 1777.7.
- D. The responsibility for compliance with this Section shall rest upon the Contractor.

**1.35 NON-DISCRIMINATION/EQUAL EMPLOYMENT OPPORTUNITY**

- A. Pursuant to Labor Code section 1735 and other applicable provisions of law, the Contractor and its subcontractors shall not discriminate against any employee or applicant for employment because of race, religious creed, color, national origin, ancestry, physical disability, mental disability, medical condition, marital status, sex, age, sexual orientation, or any other classifications protected by law on this Project. The Contractor will take affirmative action to insure that employees are treated during employment or training without regard to their race, religious creed, color, national origin, ancestry, physical disability, mental disability, medical condition, marital status, sex, age, sexual orientation, or any other classifications protected by law.
- B. Employment Eligibility; Contractor. By executing this Contract, Contractor verifies that it fully complies with all requirements and restrictions of state and federal law respecting the employment of undocumented aliens, including, but not limited to, the Immigration Reform and Control Act of 1986, as may be amended from time to time. Such requirements and restrictions include, but are not limited to, examination and retention of documentation confirming the identity and immigration status of each employee of the Contractor. Contractor also verifies that it has not committed a violation of any such law within the five (5) years immediately preceding the date of execution of this Contract, and shall not violate any such law at any time during the term of the Contract. Contractor shall avoid any violation of any such law during the term of this Contract by participating in an electronic verification of work authorization program operated by the United States Department of Homeland Security, by participating in an equivalent federal work authorization program operated by the United States Department of Homeland Security to verify information of newly hired employees, or by some other legally acceptable method. Contractor shall maintain records of each such verification, and shall make them available to the City or its representatives for inspection and copy at any time during normal business hours. The City shall not be responsible for any costs or expenses related to Contractor's compliance with the requirements provided for or referred to herein.
- C. Employment Eligibility; Subcontractors, Sub-subcontractors and Consultants. To the same extent and under the same conditions as Contractor, Contractor shall require all of its subcontractors, sub-subcontractors and consultants performing any part of the Work or of this Contract to make the same verifications and comply with all requirements and restrictions provided for herein.
- D. Employment Eligibility; Failure to Comply. Each person executing this Contract on behalf of Contractor verifies that he or she is a duly authorized officer of Contractor, and understands that any of the following shall be grounds for the City to terminate the Contract for cause: (1) failure of Contractor or its subcontractors, sub-subcontractors or consultants to meet any of the requirements provided for herein; (2) any misrepresentation or material omission concerning compliance with such requirements; or (3) failure to immediately remove from the Work any person found not to be in compliance with such requirements.



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**1.36 DEBARMENT OF CONTRACTORS AND SUBCONTRACTORS**

- A. Contractors or subcontractors may not perform work on a public works project with a subcontractor who is ineligible to perform work on a public project pursuant to Labor Code sections 1777.1 or 1777.7. 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. Any public money that is paid, or may have been paid to a debarred subcontractor by a contractor on the project shall be returned to the City. 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.

**1.37 LABOR/EMPLOYMENT SAFETY**

- A. The Contractor shall comply with all applicable laws and regulations of the federal, state, and local government, including Cal/OSHA requirements and requirements for verification of employees' legal right to work in the United States.
- B. The Contractor shall maintain emergency first aid treatment for his employees which complies with the Federal Occupational Safety and Health Act of 1970 (29 U.S.C. § 651 *et seq.*), and California Code of Regulations, Title 8, Industrial Relations Division 1, Department of Industrial Relations, Chapter 4. The Contractor shall ensure the availability of emergency medical services for its employees in accordance with California Code of Regulations, Title 8, Section 1512.
- C. The Contractor shall submit the Illness and Injury Prevention Program and a Project site specific safety program to the City prior to beginning Work at the Project site. Contractor shall maintain a confined space program that meets or exceeds the City Standards. Contractor shall adhere to the City's lock out tag out program.

**1.38 INSURANCE**

- A. The Contractor shall obtain, and at all times during performance of the Work of Contract, maintain all of the insurance described in this Section. Contractor shall not commence Work under this Contract until it has provided evidence satisfactory to the City that it has secured all insurance required hereunder. Contractor shall not allow any subcontractor to commence work on any subcontract until it has provided evidence satisfactory to the City that the subcontractor has secured all insurance required under this Section. Failure to provide and maintain all required insurance shall be grounds for the City to terminate this Contract for cause. Contractor shall furnish City with original certificates of insurance and endorsements effective coverage required by this Contract on forms satisfactory to the City. The certificates and endorsements for each insurance policy shall be signed by a person authorized by that insurer to bind coverage on its behalf, and shall be on forms acceptable to the City. All certificates and endorsements must be received and approved by the City before Work commences.



- B. **Additional Insureds; Waiver of Subrogation.** The City, its officials, officers, employees, agents and authorized volunteers shall be named as Additional Insureds on Contractor's All Risk policy and on Contractor's and its subcontractors' policies of Commercial General Liability and Automobile Liability insurance using, for Contractor's policy/ies of Commercial General Liability insurance, ISO CG forms 20 10 and 20 37 (or endorsements providing the exact same coverage, including completed operations), and, for subcontractors' policies of Commercial General Liability insurance, ISO CG form 20 38 (or endorsements providing the exact same coverage). Notwithstanding the minimum limits set forth in this Contract for any type of insurance coverage, all available insurance proceeds in excess of the specified minimum limits of coverage shall be available to the parties required to be named as Additional Insureds hereunder. Contractor and its insurance carriers shall provide a Waiver of Subrogation in favor of those parties.
- C. **Workers' Compensation Insurance.** The Contractor shall provide workers' compensation insurance for all of the employees engaged in Work under this Contract, on or at the Site, and, in case of any sublet Work, the Contractor shall require the subcontractor similarly to provide workers' compensation insurance for all the latter's employees as prescribed by State law. Any class of employee or employees not covered by a subcontractor's insurance shall be covered by the Contractor's insurance. In case any class of employees engaged in work under this Contract, on or at the Site, is not protected under the Workers' Compensation Statutes, the Contractor shall provide or shall cause a subcontractor to provide, adequate insurance coverage for the protection of such employees not otherwise protected. The Contractor is required to secure payment of compensation to his employees in accordance with the provisions of section 3700 of the Labor Code. The Contractor shall file with the City certificates of his insurance protecting workers. Company or companies providing insurance coverage shall be acceptable to the City, if in the form and coverage as set forth in the Contract Documents.
- D. **Employer's Liability Insurance.** Contractor shall provide Employer's Liability Insurance, including Occupational Disease, in the amount of at least one million dollars (\$1,000,000.00) per person per accident. Contractor shall provide City with a certificate of Employer's Liability Insurance. Such insurance shall comply with the provisions of the Contract Documents. The policy shall be endorsed, if applicable, to provide a Borrowed Servant/Alternate Employer Endorsement and contain a Waiver of Subrogation in favor of the City.
- E. **Commercial General Liability Insurance.** Contractor shall provide "occurrence" form Commercial General Liability insurance coverage at least as broad as the most current ISO CGL Form 00 01, including but not limited to, premises liability, contractual liability, products/completed operations, personal and advertising injury which may arise from or out of Contractor's operations, use, and management of the Site, or the performance of its obligations hereunder. The policy shall not contain any exclusion contrary to this Contract including but not limited to endorsements or provisions limiting coverage for (1) contractual liability (including but not limited to ISO CG 24 26 or 21 39); or (2) cross-liability for claims or suits against one insured against another. Policy limits shall not be less than \$3,000,000 per occurrence for bodily injury, personal injury and property damage, \$6,000,000 aggregate. 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. Defense costs shall be paid in addition to the limits.



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1. Such policy shall comply with all the requirements of this Section. The limits set forth herein shall apply separately to each insured against whom claims are made or suits are brought, except with respect to the limits of liability. Further the limits set forth herein shall not be construed to relieve the Contractor from liability in excess of such coverage, nor shall it limit Contractor's indemnification obligations to the City, and shall not preclude the City from taking such other actions available to the City under other provisions of the Contract Documents or law.
  2. All general liability policies provided pursuant to the provisions of this Section shall comply with the provisions of the Contract Documents.
  3. All general liability policies shall be written to apply to all bodily injury, including death, property damage, personal injury, owned and non-owned equipment, blanket contractual liability, completed operations liability, explosion, collapse, under-ground excavation, removal of lateral support, and other covered loss, however occasioned, occurring during the policy term, and shall specifically insure the performance by Contractor of that part of the indemnification contained in these General Conditions relating to liability for injury to or death of persons and damage to property.
  4. If the coverage contains one or more aggregate limits, a minimum of 50% of any such aggregate limit must remain available at all times; if over 50% of any aggregate limit has been paid or reserved, the City may require additional coverage to be purchased by Contractor to restore the required limits. Contractor may combine primary, umbrella, and as broad as possible excess liability coverage to achieve the total limits indicated above. Any umbrella or excess liability policy shall include the additional insured endorsement described in the Contract Documents.
  5. All policies of general liability insurance shall permit and Contractor does hereby waive any right of subrogation which any insurer of Contractor may acquire from Contractor by virtue of the payment of any loss.
- F. **Automobile Liability Insurance.** Contractor shall provide "occurrence" form Automobile Liability Insurance at least as broad as ISO CA 00 01 (Any Auto) in the amount of, at least, one million dollars (\$1,000,000) per accident for bodily injury and property damage. Such insurance shall provide coverage with respect to the ownership, operation, maintenance, use, loading or unloading of any auto owned, leased, hired or borrowed by Contractor or for which Contractor is responsible, in a form and with insurance companies acceptable to the City. All policies of automobile insurance shall permit and Contractor does hereby waive any right of subrogation which any insurer of Contractor may acquire from Contractor by virtue of the payment of any loss.
- G. **Builder's Risk ["All Risk"].** If required by City, It is the Contractor's responsibility to maintain or cause to be maintained Builder's Risk ["All Risk"] extended coverage insurance on all work, material, equipment, appliances, tools, and structures that are or will become part of the Work and subject to loss or damage by fire, and vandalism and malicious mischief, in an amount to cover 100% of the replacement cost. The City accepts no responsibility for the Work until the Work is formally accepted by the City. The Contractor shall provide a certificate evidencing this coverage before commencing performance of the Work.
1. The named insureds shall be Contractor, all Subcontractors of any tier (excluding those solely responsible for design work), suppliers, and City, its elected officials, officers, employees, agents and authorized volunteers, as their interests may appear. Contractor shall not be required to maintain property insurance for any portion of the Work following acceptance by City.

2. Policy shall be provided for replacement value on an "all risk" basis. There shall be no coinsurance penalty provision in any such policy. Policy must include: (1) coverage for any ensuing loss from faulty workmanship, nonconforming work, omission or deficiency in design or specifications; (2) coverage against machinery accidents and operational testing; (3) coverage for removal of debris, and insuring the buildings, structures, machinery, equipment, materials, facilities, fixtures and all other properties constituting a part of the Project; (4) transit coverage, including ocean marine coverage (unless insured by the supplier), with sub-limits sufficient to insure the full replacement value of any key equipment item; and (5) coverage with sub-limits sufficient to insure the full replacement value of any property or equipment stored either on or off the Site. Such insurance shall be on a form acceptable to City to ensure adequacy and sublimit.
3. In addition, the policy shall meet the following requirements:
  - a. Insurance policies shall be so conditioned as to cover the performance of any extra work performed under the Contract.
  - b. Coverage shall include all materials stored on site and in transit.
  - c. Coverage shall include Contractor's tools and equipment.
  - d. Insurance shall include boiler, machinery and material hoist coverage.
- H. **Contractor's Pollution Liability Coverage.** Contractor shall provide pollution liability insurance in an amount not less than \$3,000,000 per occurrence and \$6,000,000 aggregate.
- I. Contractor shall require all tiers of subcontractors working under this Contract to provide the insurance required under this Section unless otherwise agreed to in writing by City. Contractor shall make certain that any and all subcontractors hired by Contractor are insured in accordance with this Contract. If any subcontractor's coverage does not comply with the foregoing provisions, Contractor shall indemnify and hold the City harmless from any damage, loss, cost, or expense, including attorneys' fees, incurred by the City as a result thereof.

#### 1.39 FORM AND PROOF OF CARRIAGE OF INSURANCE

- A. Any insurance carrier providing insurance coverage required by the Contract Documents shall be admitted to and authorized to do business in the State of California unless waived, in writing, by the City's Risk Manager. Carrier(s) shall have an A.M. Best rating of not less than an A:VII. Insurance deductibles or self-insured retentions must be declared by the Contractor. At the election of the City the Contractor shall either 1) reduce or eliminate such deductibles or self-insured retentions, or 2) procure a bond which guarantees payment of losses and related investigations, claims administration, and defense costs and expenses. If umbrella or excess liability coverage is used to meet any required limit(s) specified herein, the Contractor shall provide a "follow form" endorsement satisfactory to the City indicating that such coverage is subject to the same terms and conditions as the underlying liability policy.
- B. Each insurance policy required by this Contract shall be endorsed to state that: (1) coverage shall not be suspended, voided, reduced or cancelled except after thirty (30) days prior written notice by certified mail, return receipt requested, has been given to the City; and (2) any failure to comply with reporting or other provisions of the policies, including breaches of warranties, shall not affect coverage provided to the City, its officials, officers, agents, employees, and volunteers.

- C. The Certificate(s) and policies of insurance shall contain or shall be endorsed to contain the covenant of the insurance carrier(s) that it shall provide no less than thirty (30) days written notice be given to the City prior to any material modification or cancellation of such insurance. In the event of a material modification or cancellation of coverage, the City may terminate the Contract or stop the Work in accordance with the Contract Documents, unless the City receives, prior to such effective date, another properly executed original Certificate of Insurance and original copies of endorsements or certified original policies, including all endorsements and attachments thereto evidencing coverage's set forth herein and the insurance required herein is in full force and effect. Contractor shall not take possession, or use the Site, or commence operations under this Contract until the City has been furnished original Certificate(s) of Insurance and certified original copies of endorsements or policies of insurance including all endorsements and any and all other attachments as required in this Section. The original endorsements for each policy and the Certificate of Insurance shall be signed by an individual authorized by the insurance carrier to do so on its behalf.
- D. The Certificate(s) of Insurance, policies and endorsements shall so covenant and shall be construed as primary, and the City's insurance and/or deductibles and/or self-insured retentions or self-insured programs shall not be construed as contributory.
- E. City reserves the right to adjust the monetary limits of insurance coverages during the term of this Contract including any extension thereof if, in the City's reasonable judgment, the amount or type of insurance carried by the Contractor becomes inadequate.
- F. Contractor shall report to the City, in addition to the Contractor's insurer, any and all insurance claims submitted by the Contractor in connection with the Work under this Contract.

#### 1.40 TIME FOR COMPLETION AND LIQUIDATED DAMAGES

- A. **Time for Completion/Liquidated Damages.** Time is of the essence in the completion of the Work. Work shall be commenced within ten (10) Days of the date stated in the City's Notice to Proceed and shall be completed by Contractor in the time specified in the Contract Documents. The City is under no obligation to consider early completion of the Project; and the Contract completion date shall not be amended by the City's receipt or acceptance of the Contractor's proposed earlier completion date. Furthermore, Contractor shall not, under any circumstances, receive additional compensation from the City (including but not limited to indirect, general, administrative or other forms of overhead costs) for the period between the time of earlier completion proposed by the Contractor and the Contract completion date. If the Work is not completed as stated in the Contract Documents, it is understood that the City will suffer damage. In accordance with Government Code section 53069.85, being impractical and infeasible to determine the amount of actual damage, it is agreed that Contractor shall pay to the City as fixed and liquidated damages, and not as a penalty, the sum stipulated in the Contract for each calendar day of delay until the Work is fully completed. Contractor and its surety shall be liable for any liquidated damages. Any money due or to become due the Contractor may be retained to cover liquidated damages.
- B. **Inclement Weather.** Contractor shall abide by the Architect's determination of what constitutes inclement weather. Time extensions for inclement weather shall only be granted when the Work stopped during inclement weather is on the critical path of the Project schedule. Refer to 01 32 00 - Construction Progress Documentation for additional information.

- C. **Extension of Time.** Contractor shall not be charged liquidated damages because of any delays in completion of the Work due to unforeseeable causes beyond the control and without the fault or negligence of Contractor (or its subcontractors or suppliers). Contractor shall within five (5) Days of identifying any such delay notify the City in writing of causes of delay. The City shall ascertain the facts and extent of delay and grant extension of time for completing the Work when, in its judgment, the facts justify such an extension. Time extensions to the Project shall be requested by the Contractor as they occur and without delay. No delay claims shall be permitted unless the event or occurrence delays the completion of the Project beyond the Contract completion date.
- D. **No Damages for Reasonable Delay.** The City's liability to Contractor for delays for which the City is responsible shall be limited to only an extension of time unless such delays were unreasonable under the circumstances. In no case shall the City be liable for any costs which are borne by the Contractor in the regular course of business, including, but not limited to, home office overhead and other ongoing costs. Damages caused by unreasonable City delay, including delays caused by items that are the responsibility of the City pursuant to Government Code section 4215, shall be based on actual costs only, no proportions or formulas shall be used to calculate any delay damages.

#### 1.41 COST BREAKDOWN AND PERIODIC ESTIMATES

- A. Contractor shall furnish on forms Approved by the City:
1. Within ten (10) Days of Notice to Proceed with the Contract, a detailed estimate giving a complete breakdown of the Contract price, if the Contract amount is a lump sum.
  2. A monthly itemized estimate of Work done for the purpose of making progress payments. In order for the City to consider and evaluate each progress payment application, the Contractor shall submit a detailed measurement of Work performed and a progress estimate of the value thereof before the tenth (10th) Day of the following month.
  3. Contractor shall submit, with each of its payment requests, an adjusted list of actual quantities, verified by the Engineer, for unit price items listed, if any, in the Bid Form.
  4. Following the City's Acceptance of the Work, the Contractor shall submit to the City a written statement of the final quantities of unit price items for inclusion in the final payment request.
  5. The City shall have the right to adjust any estimate of quantity and to subsequently correct any error made in any estimate for payment.
- B. Contractor shall certify under penalty of perjury, that all cost breakdowns and periodic estimates accurately reflect the Work on the Project.

#### 1.42 PROGRESS ESTIMATES AND PAYMENT

- A. By the tenth (10th) Day of the following calendar month, Contractor shall submit to Architect a payment request on Forms CC1: Progress Payment Request and substantiated on Form CC2 – Progress Payment Request - Detail, which shall set forth in detail the value of the Work done for the period beginning with the date work was first commenced and ending on the end of the calendar month for which the payment request is prepared. Contractor shall include any amount earned for authorized extra work and shall submit Form CC3 – Quantity Change Verification Form, where there is quantity changes authorized as part of the progress or final payment. From the total thus computed, a deduction shall be made in the amount of five percent (5%) for retention, except where the City has adopted a finding that the Work done under the Contract is substantially complex, and then the amount withheld as retention shall be the percentage specified in the Notice Inviting Bids. From the remainder, a further deduction may be made in accordance with Section B below. The amount computed, less the amount withheld for retention and any amounts withheld as set forth below, shall be the amount of the Contractor's payment request.
- B. The City may withhold a sufficient amount or amounts of any payment or payments otherwise due to Contractor, as in his judgment may be necessary to cover:
1. Payments which may be past due and payable for just claims against Contractor or any subcontractors for labor or materials furnished in and about the performance of work on the Project under this Contract.
  2. Defective work not remedied.
  3. Failure of Contractor to make proper payments to his subcontractor or for material or labor.
  4. Completion of the Contract if there is a reasonable doubt that the Work can be completed for balance then unpaid.
  5. Damage to another contractor or a third party.
  6. Amounts which may be due the City for claims against Contractor.
  7. Failure of Contractor to keep the record ("as-built") drawings up to date.
  8. Failure to provide update on construction schedule as required herein.
  9. Site cleanup.
  10. Failure to comply with Contract Documents.
  11. Liquidated damages.
  12. Legally permitted penalties.
- C. The City may apply such withheld amount or amounts to payment of such claims or obligations at its discretion with the exception of subsections (B)(1), (3), and (5) of this Section, which must be retained or applied in accordance with applicable law. In so doing, the City shall be deemed the agent of Contractor and any payment so made by the City shall be considered as a payment made under contract by the City to Contractor and the City shall not be liable to Contractor for such payments made in good faith. Such payments may be made without prior judicial determination of claim or obligations. The City will render Contractor a proper accounting of such funds disbursed on behalf of Contractor.



- D. Upon receipt, the Architect shall review the payment request to determine whether it is undisputed and suitable for payment. If the payment request is determined to be unsuitable for payment, it shall be returned to Contractor as soon as practicable but not later than seven (7) Days after receipt, accompanied by a document setting forth in writing the reasons why the payment request is not proper. The City shall make the progress payment within 30 calendar days after the receipt of an undisputed and properly submitted payment request from Contractor, provided that a release of liens and claims has been received from the Contractor pursuant to Civil Code section 8132. The number of days available to the City to make a payment without incurring interest pursuant to this paragraph shall be reduced by the number of days by which the Architect exceeds the seven (7) Day requirement.
- E. A payment request shall be considered properly executed if funds are available for payment of the payment request and payment is not delayed due to an audit inquiry by the financial officer of the City.

**1.43 SECURITIES FOR MONEY WITHHELD**

- A. Pursuant to section 22300 of the Public Contract Code of the State of California, Contractor may request the City to make retention payments directly to an escrow agent or may substitute securities for any money withheld by the City to ensure performance under the contract. At the request and expense of Contractor, securities equivalent to the amount withheld shall be deposited with the City or with a state or federally chartered bank as the escrow agent who shall return such securities to Contractor upon satisfactory completion of the contract. Deposit of securities with an escrow agent shall be subject to a written agreement substantially in the form provided in section 22300 of the Public Contract Code.

**1.44 CHANGES AND EXTRA WORK.**

**A. Contract Change Orders.**

- 1. The City, without invalidating the Contract, may order changes in the Work consisting of additions, deletions or other revisions, and the Contract Price and Contract Time shall be adjusted accordingly. Except as otherwise provided herein, all such changes in the Work shall be authorized by Change Order, and shall be performed under the applicable conditions of the Contract Documents. A Change Order signed by the Contractor indicates the Contractor's agreement therewith, including any adjustment in the Contract Price or the Contract Time, and the full and final settlement of all costs (direct, indirect and overhead) related to the Work authorized by the Change Order.
- 2. Contractor shall promptly execute changes in the Work as directed in writing by the City even when the parties have not reached agreement on whether the change increases the scope of Work or affects the Contract Price or Contract Time. All claims for additional compensation to the Contractor shall be presented in writing. No claim will be considered after the Work in question has been done unless a written Change Order has been issued or a timely written notice of claim has been made by Contractor.
- 3. Whenever any change is made as provided for herein, such change shall be considered and treated as though originally included in the Contract, and shall be subject to all terms, conditions, and provisions of the original Contract.
- 4. Contractor shall not be entitled to claim or bring suit for damages, whether for loss of profits or otherwise, on account of any decrease or omission of any item or portion of Work to be done.

5. No dispute, disagreement, or failure of the parties to reach agreement on the terms of the Change Order shall relieve the Contractor from the obligation to proceed with performance of the work, including Additional Work, promptly and expeditiously.
  6. Contractor shall make available to the City any of the Contractor's documents related to the Project immediately upon request of the City, as set forth in Article 52.
  7. Any alterations, extensions of time, Additional Work, or any other changes may be made without securing consent of the Contractor's surety or sureties.
- B. Contract Price Change.**
1. Process for Determining Adjustments in Contract Price.
    - a. Owner Initiated Change. The Contractor must submit a complete cost proposal, including any change in the Contract Price or Contract Time, within seven (7) Days after receipt of a scope of a proposed change order initiated by the City, unless the City requests that proposals be submitted in less than seven (7) Days.
    - b. Contractor Initiated Change. The Contractor must give written notice of a proposed change order required for compliance with the Contract Documents within seven (7) Days of discovery of the facts giving rise to the proposed change order.
    - c. Whenever possible, any changes to the Contract amount shall be in a lump sum mutually agreed to by the Contractor and the City.
    - d. Price quotations from the Contractor shall be accompanied by sufficiently detailed supporting documentation to permit verification by the City, including but not limited to estimates and quotations from subcontractors or material suppliers, as the City may reasonably request. Contractor shall certify the accuracy of all Change Order Requests under penalty of perjury.
    - e. If the Contractor fails to submit a complete cost proposal within the seven (7) Day period (or as requested), the City has the right to order the Contractor in writing to commence the Work immediately on a time and materials basis and/or issue a lump sum change to the Contract Price and/or Contract Time in accordance with the City's estimate. If the change is issued based on the City's estimate, the Contractor will waive its right to dispute the action unless within fifteen (15) Days following completion of the added/deleted work, the Contractor presents written proof that the City's estimate was in error.
  2. Unit Price Change Orders.
    - a. When the actual quantity of a Unit Price item varies from the Bid Form, compensation for the change in quantity will be calculated by multiplying the actual quantity by the Unit Price. This calculation may result in either an additive or deductive Final Change Order pursuant to the Contract Documents.
    - b. **No Mark up for Overhead and Profit.** Because the Contract Unit Prices provided in the Bid Form include Overhead and Profit as determined by Contractor at the time of Bid submission, no mark up or deduction for Overhead and Profit will be included in Unit Price Change Orders.
    - c. Bid items included on the Bid Form may be deducted from the Work in their entirety without any negotiated extra costs.



- d. Contractor acknowledges that unit quantities are estimates and agrees that the estimated unit quantities listed on the Bid Form will be adjusted to reflect the actual unit quantities which may result in an adjustment to the Contract Unit Prices. Such an adjustment will be made by execution of a final additive or deductive Change Order following Contractor's completion of the Work. Upon notification, Contractor's failure to respond within seven (7) Days will result in City's issuance of a unit quantity adjustment to the Contract Unit Prices and/or Contract Time in accordance with the Contract Documents.
- e. The City or Contractor may make a Claim for an adjustment in the Unit Price in accordance with the Contract Documents if:
  - 1) The quantity of any item of Unit Price Work performed by Contractor differs by twenty-five percent (25%) or more from the estimated quantity of such item indicated in the Contract; and
  - 2) There is no corresponding adjustment with respect to any other item of Work; and
  - 3) Contractor believes that Contractor is entitled to an increase in Unit Price as a result of having incurred additional expense or the City believes that the City is entitled to a decrease in Unit Price and the parties are unable to agree as to the amount of any such increase or decrease.
3. Contractor shall incorporate the provisions of this Section into all agreements with Subcontractors. Compensation for Lump Sum Change Orders shall be limited to expenditures necessitated specifically by the Additional Work, and shall be according to the following:
  - a. Overview. The Contractor will submit a properly itemized Lump Sum Change Order Proposal covering the Additional Work and/or the work to be deleted. This proposal will be itemized for the various components of the Additional Work and segregated by labor, material, and equipment in a detailed format satisfactory to the City. The City will require itemized change orders on all change order proposals from the Contractor, subcontractors, and sub- subcontractors regardless of tier. Details to be submitted will include detailed line item estimates showing detailed materials quantity take-offs, material prices by item and related labor hour pricing information and extensions (by line item or by drawing as applicable).
  - b. Labor. The costs of labor will be the actual cost for wages prevailing locally for each craft or type of worker at the time the Additional Work is done, plus employer payments of payroll taxes and insurance, health and welfare, pension, vacation, apprenticeship funds, and other direct costs resulting from Federal, State or local laws, as well as assessment or benefits required by lawful collective bargaining agreements. The use of a labor classification which would increase the Additional Work cost will not be permitted unless the Contractor establishes the necessity for such new classifications. Labor costs for equipment operators and helpers shall be reported only when such costs are not included in the invoice for equipment rental.

Estimated labor hours must only include hours for those workmen and working foremen directly involved in performing the change order work. Supervision above the level of working foremen (such as general foremen, superintendent, project manager, etc.) is considered to be included in the markup percentages as outlined below. Note that no separate allowances for warranty expense will be allowed as a direct cost of a change order. Costs attributed to warranty expenses will be considered to be covered by the markup.

- c. Labor Burden. Labor burden allowable in change orders shall be defined as employer's net actual cost of payroll taxes (FICA, Medicare, SUTA, FUTA), net actual cost for employer's cost of union benefits (or other usual and customary fringe benefits if the employees are not union employees), and net actual cost to employer for worker's compensation insurance taking into consideration adjustments for experience modifiers, premium discounts, dividends, rebates, expense constants, assigned risk pool costs, net cost reductions due to policies with deductibles for self-insured losses, assigned risk rebates, etc. Contractor shall reduce their standard payroll tax percentages to properly reflect the effective cost reduction due to the estimated impact of the annual maximum wages subject to payroll taxes. An estimated percentage for labor burden may be used for pricing change orders. However, the percentage used for labor burden to price change orders will be examined at the conclusion of the Project and an adjustment to the approved change orders will be processed if it is determined that the actual labor burden percentage should have been more or less than the estimated percentage used.
- d. Materials. The cost of materials reported shall be at invoice or lowest current price at which such materials are locally available in the quantities involved, plus sales tax, freight, and delivery. Materials costs shall be based upon supplier or manufacturer's invoice. If invoices or other satisfactory evidence of cost are not furnished within fifteen (15) Days of delivery, then the City shall determine the materials cost, at its sole discretion. Estimated material change order costs shall reflect the Contractor's reasonably anticipated net actual cost for the purchase of the material needed for the change order work. Estimated material costs shall reflect cost reductions available to the Contractor due to "non-cash" discounts, trade discounts, free material credits, and/or volume rebates. "Cash" discounts (i.e., prompt payment discounts of 2% or less) available on material purchased for change order work shall be credited to the City if the Contractor is provided the City funds in time for Contractor to take advantage of any such "cash" discounts. The portion of any "cash" discounts greater than 2% will not be considered "non-cash" discount for purposes of this provision. Price quotations from material suppliers must be itemized with unit prices for each specific item to be purchased. "Lot pricing" quotations will not be considered sufficient substantiating detail.
- e. Tool and Equipment Use. Costs for the use of small tools, which are tools that have a replacement value of \$1,000 or less, shall be considered included in the Overhead and Profit mark-ups established below. Allowable change order estimated costs may include appropriate amounts for rental of major equipment specifically needed to perform the change order work (defined as tools and equipment with an individual purchase cost of more than \$750). For Contractor owned equipment, the "bare" equipment rental rates allowed to be used for pricing change order proposals shall be 75% of the monthly rate listed in the most current publication of The AED Green Book divided by 176 to arrive at a maximum hourly rate to be applied to the hours the equipment is used performing the change order work. Further, for Contractor owned equipment, the aggregate equipment rent charges for any single piece of equipment used in all change order work shall be limited to 50% of the fair market value of the piece of equipment when the first change order is priced involving usage of the piece of equipment. Fuel necessary to operate the equipment will be considered as a separate direct cost associated with the change order work.

- f. Maximum Markup Percentage Allowable on Self-Performed Work. With respect to pricing change orders, the maximum markup percentage to be paid to any Contractor or subcontractor (regardless of tier) on self-performed work shall be a single markup percentage not-to-exceed fifteen percent (15%) of the net direct cost of (1) direct labor and allowable labor burden costs applicable to the change in the Work; (2) the net cost of material and installed equipment incorporated into the change in the Work, and (3) net rental cost of major equipment and related fuel costs necessary to complete the change in the Work. The markup computed using the above formula shall be considered to be allocated 2/3 to cover applicable overhead costs directly attributable to the field overhead costs related to processing, supervising and performing, the change order work, and the remaining 1/3 to cover home office overhead costs and profit.
- g. Maximum Markup Percentages Allowable on Work Performed by Lower Tier Subcontractors. With respect to pricing the portion of change order proposals involving Work performed by lower tier contractors, the maximum markup percentage allowable to the Contractor or subcontractor supervising the lower tier subcontractor's work shall not exceed five percent (5%) of the net of all approved change order work performed by all subcontractors combined for any particular change order proposal. The markup computed using the above formula shall be considered to be allocated 2/3 to cover applicable overhead costs directly attributable to the field overhead costs related to processing, supervising and performing the change order work, and the remaining 1/3 to cover home office overhead costs and profit.
- h. No Markup on Bonds and Liability Insurance Costs. Change order cost adjustments due to increases or decreases in bond or insurance costs (if applicable) shall not be subject to any markup.
- i. Direct and Indirect Costs Covered by Markup Percentages. As a further clarification, the agreed upon markup percentage set forth above is intended to cover the Contractor's profit and all indirect costs associated with the change order work. Items intended to be covered by the markup percentage include, but are not limited to: home office expenses, branch office and field office overhead expense of any kind, project management, superintendents, general foremen, estimating, engineering, coordinating, expediting, purchasing, detailing, legal, accounting, data processing or other administrative expenses, shop drawings, permits, auto insurance and umbrella insurance, pick-up truck costs, and warranty expense costs. The cost for the use of small tools is also to be considered covered by the markup percentage established above. Small tools shall be defined as tools and equipment (power or non-power) with an individual purchase cost of less than \$750.
- j. Deduct Change Orders and Net Deduct Changes. The application of the markup percentages referenced above will apply to both additive and deductive change orders. In the case of a deductive change order, the credit will be computed by applying the sliding scale percentages as outlined above so that a deductive change order would be computed in the same manner as an additive change order. In those instances where a change involves both additive and deductive work, the additions and deductions will be netted and the markup percentage adjustments will be applied to the net amount.

- k. Contingency. In no event will any lump sum or percentage amounts for "contingency" be allowed to be added as a separate line item in change order estimates. Unknowns attributable to labor hours will be accounted for when estimating labor hours anticipated performing the work. Unknowns attributable to material scrap and waste will be estimated as part of material costs.
- l. Insurance and Bonds. In the event the Contractor has been required to furnish insurance and/or bonds as part of the base contract price, a final contract change order will be processed to account for the Contractor's net increase or decrease in insurance costs and/or bond premium costs associated with change orders to Contractor's base Contract Price.
- 4. Time and Materials Change Orders.
  - a. General. The term Time and Materials means the sum of all costs reasonably and necessarily incurred and paid by Contractor for labor, materials, and equipment in the proper performance of Additional Work. Except as otherwise may be agreed to in writing by the City, such costs shall be in amounts no higher than those prevailing in the locality of the Project, and shall include only the following items.
  - b. Timely and Final Documentation.
    - 1) T&M Daily Sheets. Contractor must submit timesheets, materials invoices, records of equipment hours, and records of rental equipment hours to the City's Representative for an approval signature **each day** Additional Work is performed. Failure to get the City's Representative's approval signature each Day shall result in a waiver of Contractor's right to claim these costs. The City's Representative's signature on time sheets only serves as verification that the Work was performed and is not indicative of City's agreement to Contractor's entitlement to the cost.
    - 2) T&M Daily Summary Sheets. All documentation of incurred costs ("T&M Daily Summary Sheets") shall be submitted by Contractor within **three (3) Days** of incurring the cost for labor, material, equipment, and special services as Additional Work is performed. Contractor's actual costs shall be presented in a summary table in an electronic spreadsheet file by labor, material, equipment, and special services. Each T&M Daily Summary Sheet shall include Contractor's actual costs incurred for the Additional Work performed that day and a cumulative total of Contractor's actual costs incurred for the Additional Work. Contractor's failure to provide a T&M Daily Summary Sheet showing a total cost summary within three (3) Days but within five (5) Days of performance of the Work will result in the Contractor's otherwise allowable overhead and profit being reduced by 50% for that portion of Additional Work which was not documented in a timely manner. Contractor's failure to submit the T&M Daily Summary Sheet within five (5) Days of performance of the Work will result in a total waiver of Contractor's right to claim these costs.
    - 3) T&M Total Cost Summary Sheet. Contractor shall submit a T&M Total Cost Summary Sheet, which shall include total actual costs, within **seven (7) Days** following completion of City approved Additional Work. Contractor's total actual cost shall be presented in a summary table in an electronic spreadsheet file by labor, material, equipment, and special services. Contractor's failure to submit the T&M Total Cost Summary Sheet within seven (7) Days of completion of the Additional Work will result in



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Contractor's waiver for any reimbursement of any costs associated with the T&M Summary Sheets or the performance of the Additional Work.

- c. Labor. The Contractor will be paid the cost of labor for the workers used in the actual and direct performance of the Work. The cost of labor will be the sum of the actual wages paid (which shall include any employer payments to or on behalf of the workers for health and welfare, pension, vacation, and similar purposes) substantiated by timesheets and certified payroll for wages prevailing for each craft or type of workers performing the Additional Work at the time the Additional Work is done, and the labor surcharge set forth in the Department of Transportation publication entitled *Labor Surcharge and Equipment Rental Rates*, which is in effect on the date upon which the Work is accomplished and which is a part of the Contract. The labor surcharge shall constitute full compensation for all payments imposed by Federal, State, or local laws and for all other payments made to, or on behalf of, the workers, other than actual wages.
  - 1) Equipment Operator Exception. Labor costs for equipment operators and helpers shall be paid only when such costs are not included in the invoice for equipment rental.
  - 2) Foreman Exception. The labor costs for foremen shall be proportioned to all of their assigned work and only that applicable to the Additional Work shall be paid. Indirect labor costs, including, without limitation, the superintendent, project manager, and other labor identified in the Contract Documents will be considered Overhead.
- d. Materials. The cost of materials reported shall be itemized at invoice or lowest current price at which materials are locally available and delivered to the Project site in the quantities involved, plus the cost of sales tax, freight, delivery, and storage.
  - 1) Trade discounts available to the purchaser shall be credited to the City notwithstanding the fact that such discounts may not have been taken by Contractor.
  - 2) For materials secured by other than a direct purchase and direct billing to the purchaser, the cost shall be deemed to be the price paid to the actual supplier as determined by the City's Representative.
  - 3) Payment for materials from sources owned wholly or in part by the purchaser shall not exceed the price paid by the purchaser for similar materials from said sources on Additional Work items or the current wholesale price for such materials delivered to the Project site, whichever price is lower.
  - 4) If, in the opinion of the City's Representative, the cost of materials is excessive, or Contractor does not furnish satisfactory evidence of the cost of such materials, then the cost shall be deemed to be the lowest current wholesale price for the total quantity concerned delivered to the Project site less trade discounts.
  - 5) The City reserves the right to furnish materials for the Additional Work and no Claim shall be allowed by Contractor for costs of such materials or Indirect Costs or profit on City furnished materials.
- e. Equipment.



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- 1) Rental Time. The rental time to be paid for equipment on the Project site shall be the time the equipment is in productive operation on the Additional Work being performed and, in addition, shall include the time required to move the equipment to the location of the Additional Work and return it to the original location or to another location requiring no more time than that required to return it to its original location; except that moving time will not be paid if the equipment is used on other than the Additional Work, even though located at the site of the Additional Work.
  - (a) Rental Time Not Allowed. Rental time will not be allowed while the equipment is inoperative due to breakdowns.
  - (b) Computation Method. The following shall be used in computing the rental time of equipment on the Project site.
    - (1) When hourly rates are paid, any part of an hour less than 30 minutes of operation shall be considered to be 1/2-hour of operation, and any part of an hour in excess of 30 minutes will be considered one hour of operation.
    - (2) When daily rates are paid, any part of a day less than 4 hours operation shall be considered to be 1/2-day of operation, and any part of an hour in excess of 4 hours will be considered one day of operation.
- 2) Rental Rates. Contractor will be paid for the use of equipment at the lesser of (i) the actual rental rate, or (ii) the rental rate listed for that equipment in the California Department of Transportation publication entitled *Labor Surcharge and Equipment Rental Rates*, which is in effect on the date upon which the Contract was executed. Such rental rates will be used to compute payments for equipment whether the equipment is under Contractor's control through direct ownership, leasing, renting, or another method of acquisition. The rental rate to be applied for use of each item of equipment shall be the rate (i.e., daily, monthly) resulting in the least total cost to the City for the total period of use. If it is deemed necessary by Contractor to use equipment not listed in the publication, an equitable rental rate for the equipment will be established by the City's Representative. Contractor may furnish cost data which might assist the City's Representative in the establishment of the rental rate.
- 3) Contractor-Owned Equipment.
  - (a) For Contractor-owned equipment, the allowed equipment rental rate will be limited to the monthly equipment rental rate using a utilization rate of 173 hours per month.
  - (b) For Contractor-owned equipment, the rental time to be paid for equipment on the Site shall be the time the equipment is in productive operation, unless, in the instance of standby time, the equipment could be actively used by Contractor on another project, then City shall pay for the entirety of the time the equipment is on Site. It shall be Contractor's burden to demonstrate to the City that the equipment could be actively used on another project.
- 4) All equipment shall, in the opinion of the City's Representative, be in good working condition and suitable for the purpose for which the equipment is to be used.





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- 5) Before construction equipment is used on the Additional Work, Contractor shall plainly stencil or stamp an identifying number thereon at a conspicuous location, and shall furnish to the City's Representative, in duplicate, a description of the equipment and its identifying number and the scheduled Additional Work activities planned.
  - 6) Unless otherwise specified, manufacturer's rating and manufacturer approved modifications shall be used to classify equipment for the determination of applicable rental rates. Equipment which has no direct power unit shall be powered by a unit of at least the minimum rating recommended by the manufacturer.
- f. Special Services. Special work or services are defined as that Additional Work characterized by extraordinary complexity, sophistication, or innovation or a combination of the foregoing attributes which are unique to the construction industry.
- 1) Invoices for Special Services. When the City's Representative and Contractor determine that a special service is required which cannot be performed by the forces of Contractor or those of any of its Subcontractors, the special service may be performed by an entity especially skilled in the Additional Work. Invoices for special services based upon the current fair market value thereof may be accepted without complete itemization of labor, material, and equipment rental costs, after validation of market values by the City's Representative.
  - 2) Discount and Allowance. All invoices for special services will be adjusted by deducting all trade discounts offered or available, whether the discounts were taken or not. In lieu of Overhead and Profit specified herein, a total allowance not to exceed fifteen percent (15%) for Overhead and Profit will be added to invoices for Special Services.
  - 3) When the City determines, in its sole discretion, that competitive bidding is necessary for certain special services, Contractor shall solicit competitive bids for those special services.
- g. Excluded Costs. The term Time and Material shall not include any of the following costs or any other home or field office overhead costs, all of which are to be considered administrative costs covered by Contractor's allowance for Overhead and Profit.
- 1) Overhead Cost. Payroll costs and other compensation of Contractor's officers, executives, principals, general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, timekeepers, clerks, and other personnel employed by Contractor whether at the Site or in Contractor's principal office or any branch office, material yard, or shop for general administration of the Additional Work;
  - 2) Office Expenses. Expenses of Contractor's principal and branch offices;
  - 3) Capital Expenses. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Additional Work and charges against Contractor for delinquent payments;
  - 4) Negligence. Costs due to the negligence of Contractor or any Subcontractor or Supplier, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including without limitation the correction of Defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property;



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- 5) Other. Other overhead or general expense costs of any kind and the cost of any item not specifically and expressly included in the Contract Documents;
  - 6) Small Tools. Cost of small tools valued at less than \$1,000 and that remain the property of Contractor;
  - 7) Administrative Costs. Costs associated with the preparation of Change Orders (whether or not ultimately authorized), cost estimates, or the preparation or filing of Claims;
  - 8) Anticipated Lost Profits. Expenses of Contractor associated with anticipated lost profits or lost revenues, lost income or earnings, lost interest on earnings, or unpaid retention;
  - 9) Home Office Overhead. Costs derived from the computation of a "home office overhead" rate by application of the *Eichleay*, *Allegheny*, burden fluctuation, or other similar methods;
  - 10) Special Consultants and Attorneys. Costs of special consultants or attorneys, whether or not in the direct employ of Contractor, employed for services specifically related to the resolution of a Claim, dispute, or other matter arising out of or relating to the performance of the Additional Work.
- h. Overhead, Profit and Other Charges. The mark-up for overhead (including supervision) and profit on work added to the Contract shall be according to the following:
- 1) "Net Cost" is defined as consisting of costs of labor, materials, and tools and equipment only excluding overhead and profit. The costs of applicable insurance and bond premium will be reimbursed to the Contractor and subcontractors at cost only, without mark-up. Contractor shall provide City with documentation of the costs, including, but not limited to, payroll records, invoices, and such other information as City may reasonably request.
  - 2) For Work performed by the Contractor's forces, the added cost for overhead and profit shall not exceed fifteen percent (15%) of the Net Cost of the Work.
  - 3) For Work performed by a subcontractor, the added cost for overhead and profit shall not exceed fifteen percent (15%) of the subcontractor's Net Cost of the Work to which the Contractor may add five percent (5%) of the subcontractor's Net Cost.
  - 4) For Work performed by a sub-subcontractor, the added cost for overhead and profit shall not exceed fifteen percent (15%) of the sub-subcontractor's Net Cost for Work to which the subcontractor and general contractor may each add an additional five percent (5%) of the Net Cost of the lower tier subcontractor.
  - 5) No additional mark-up will be allowed for lower tier subcontractors, and in no case shall the added cost for overhead and profit payable by City exceed twenty-five percent (25%) of the Net Cost as defined herein, of the party that performs the Work.





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5. All of the following costs are included in the markups for overhead and profit described above, and Contractor shall not receive any additional compensation for: Submittals, drawings, field drawings, Shop Drawings, including submissions of drawings; field inspection; General Superintendence; General administration and preparation of cost proposals, schedule analysis, Change Orders, and other supporting documentation; computer services; reproduction services; Salaries of project Architect, superintendent, timekeeper, storekeeper, and secretaries; Janitorial services; Small tools, incidentals and consumables; Temporary On-Site facilities (Offices, Telephones, High Speed Internet Access, Plumbing, Electrical Power, Lighting; Platforms, Fencing, Water), Jobsite and Home office overhead or other expenses; vehicles and fuel used for work otherwise included in the Contract Documents; Surveying; Estimating; Protection of Work; Handling and disposal fees; Final Cleanup; Other Incidental Work; Related Warranties; insurance and bond premiums.
  6. For added or deducted Work by subcontractors, the Contractor shall furnish to the City the subcontractor's signed detailed record of the cost of labor, material and equipment, including the subcontractor markup for overhead and profit. The same requirement shall apply to sub-subcontractors.
  7. For added or deducted work furnished by a vendor or supplier, the Contractor shall furnish to the City a detailed record of the cost to the Contractor, signed by such vendor or supplier.
  8. Any change in the Work involving both additions and deletions shall indicate a net total cost, including subcontracts and materials. Allowance for overhead and profit, as specified herein, shall be applied if the net total cost is an increase in the Contract Price; overhead and profit allowances shall not be applied if the net total cost is a deduction to the Contract Price. The estimated cost of deductions shall be based on labor and material prices on the date the Contract was executed.
  9. Contractor shall not reserve a right to assert impact costs, extended job site costs, extended overhead, constructive acceleration and/or actual acceleration beyond what is stated in the Change Order for Work. No claims shall be allowed for impact, extended overhead costs, constructive acceleration and/or actual acceleration due to a multiplicity of changes and/or clarifications. The Contractor may not change or modify the City's change order form in an attempt to reserve additional rights.
  10. If the City disagrees with the proposal submitted by Contractor, it will notify the Contractor and the City will provide its opinion of the appropriate price and/or time extension. If the Contractor agrees with the City, a Change Order will be issued by the City. If no agreement can be reached, the City shall have the right to issue a unilateral Change Order setting forth its determination of the reasonable additions or savings in costs and time attributable to the extra or deleted work. Such determination shall become final and binding if the Contractor fails to submit a claim in writing to the City within fifteen (15) Days of the issuance of the unilateral Change Order, disputing the terms of the unilateral Change Order, and providing such supporting documentation for its position as the City may require.
- C. Change of Contract Times.**
1. The Contract Times may only be changed by a Change Order.



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2. All changes in the Contract Price and/or adjustments to the Contract Times related to each change shall be included in Contractor's COR pursuant to this Section. No cost or time will be allowed for cumulative effects of multiple changes. All Change Orders must state that the Contract Time is not changed or is either increased or decreased by a specific number of days. Failure to include a change to time shall waive any change to the time unless the parties mutually agree in writing to postpone a determination of the change to time resulting from the Change Order.
3. Notice of the amount of the request for adjustment in the Contract Times with supporting data shall be delivered within seven (7) Days after such start of occurrence. No extension of time or additional compensation shall be given for a delay if the Contractor failed to give notice in the manner and within the time prescribed.
4. City may elect, at City's sole discretion, to grant an extension in Contract Times, without Contractor's request, because of delays or other factors.
5. Use of Float and Critical Path.
  - a. Float is for the benefit of the Project. Float shall not be considered for the exclusive use or benefit of either the City or the Contractor.
  - b. Any difference in time between the Contractor's early completion and the Contract Time shall be considered a part of the Project float. Contractor shall not be entitled to compensation, and City will not compensate Contractor, for delays which impact early completion.
6. Contractor's entitlement to an extension of the Contract Times is limited to a City-caused extension of the critical path, reduced by the Contractor's concurrent delays, and established by a proper time impact analysis. No time extension shall be allowed unless, and then only to the extent that, the City-caused delay extends the critical path beyond the previously approved Contract Time.
  - a. Contractor shall not be entitled to an adjustment in the Contract Price or Contract Times for delays within the control of Contractor. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of Contractor.
  - b. If Contractor is delayed in the performance or progress of the Work by fire, flood, epidemic, abnormal weather conditions (as determined by the City), Acts of God, acts or failures to act of utility owners not under the control of City, or other causes not the fault of and beyond control of City and Contractor, then Contractor shall be entitled to an time extension when the Work stopped is on the critical path. Such a non-compensable adjustment shall be Contractor's sole and exclusive remedy for such delays. Contractor must submit a timely request in accordance with the requirements of this Section.
  - c. Utility-Related Delays.
    - 1) Contractor shall immediately notify in writing the utility owner and City's Representative of its construction schedule and any subsequent changes in the construction schedule which will affect the time available for protection, removal, or relocation of utilities. Requests for extensions of time arising out of utility relocation or repair delays shall be filed in accordance with this Section.
    - 2) Contractor shall not be entitled to damages or additional payment for delays attributable to utility relocations or alterations if correctly located, as noted in the Contract Documents or by the Underground Service Alert survey.



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7. Content for Requests for Contract Extension. Contractor's justification for entitlement shall be clear and complete, citing specific Contract Document references and reasons on which the Contractor's entitlement is based. At a minimum, each request for a time extension must include:
  - a. Each request for an extension of Contract Time must identify the impacting event, in narrative form, providing a description of the delay event and sufficient justification as to why the Contractor is entitled to a time extension. Contractor must demonstrate that the delay arises from unforeseeable causes beyond the control and without the fault or negligence of both Contractor and any Subcontractors or Suppliers, or any other persons or organizations employed by any of them or for whose acts any of them may be liable, and that such causes in fact lead to performance or completion of the Work, or specified part in question, beyond the corresponding Contract Times, despite Contractor's reasonable and diligent actions to guard against those effects.
  - b. Each request for an extension of Contract Time must include a time impact analysis in CPM format, using the Contemporaneous Impacted As-Planned Schedule Analysis to calculate the impact of the delay event.
8. No Damages for Reasonable Delay.
  - a. City's liability to Contractor for delays for which City is responsible shall be limited to only an extension of time unless such delays were unreasonable under the circumstances. In no case shall City be liable for any costs which are borne by the Contractor in the regular course of business, including, but not limited to, home office overhead and other ongoing costs.
  - b. Damages caused by unreasonable City delay that impact the critical path, including delays caused by items that are the responsibility of the City pursuant to Government Code section 4215, shall be compensated at the Daily Rate established in the Special Conditions. No other calculations, proportions or formulas shall be used to calculate any delay damages.
  - c. City and City's Representative, and the officers, members, partners, employees, agents, consultants, or subcontractors of each of them, shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.
9. Contractor's failure, neglect, or refusal to comply with the requirements of the Contract Documents, or any portion thereof, shall bar Contractor's request for extensions of the Contract Times. Such failure, neglect, or refusal prejudices City's and City's Representative's ability to recognize and mitigate delay, and such failure, neglect, or refusal prevent the timely analysis of requests for extensions of Contract Times, and whether such extensions may be warranted. Contractor hereby waives all rights to extensions of Contract Times due to delays or accelerations that result from or occur during periods of time for which Contractor fails, neglects, or refuses to fully comply with the requirements of this Section.

**1.45 FINAL ACCEPTANCE AND PAYMENT**

- A. The acceptance of the Work on behalf of the City will be made by the Architect. Such acceptance by the City shall not constitute a waiver of defects. When the Work has been accepted there shall be paid to Contractor a sum equal to the contract price less any amounts previously paid Contractor and less any amounts withheld by the City from Contractor under the terms of the contract. The final five percent (5%), or the percentage specified in the notice inviting bids where the City has adopted a finding of substantially complete, shall not become due and payable until five (5) calendar days shall have elapsed after the expiration of the period within which all claims may be filed under the provisions of Civil Code section 9356. If the Contractor has placed securities with the City as described herein, the Contractor shall be paid a sum equal to one hundred percent (100%) of the contract price less any amounts due the City under the terms of the Contract.
- B. Unless Contractor advises the City in writing prior to acceptance of the final five percent (5%) or the percentage specified in the notice inviting bids where the City has adopted a finding of substantially complete, or the return of securities held as described herein, said acceptance shall operate as a release to the City of all claims and all liability to Contractor for all things done or furnished in connection with this work and for every act of negligence of the City and for all other claims relating to or arising out of this work. If Contractor advises the City in writing prior to acceptance of final payment or return of the securities that there is a dispute regarding the amount due the Contractor, the City may pay the undisputed amount contingent upon the Contractor furnishing a release of all undisputed claims against the City with the disputed claims in stated amounts being specifically excluded by Contractor from the operation of the release. No payments, however, final or otherwise, shall operate to release Contractor or its sureties from the Faithful Performance Bond, Labor and Material Payment Bond, or from any other obligation under this contract.
- C. In case of suspension of the contract any unpaid balance shall be and become the sole and absolute property of the City to the extent necessary to repay the City any excess in the cost of the Work above the contract price.
- D. Final payment shall be made no later than 60 days after the date of acceptance of the Work by the City or the date of occupation, beneficial use and enjoyment of the Work by the City including any operation only for testing, start-up or commissioning accompanied by cessation of labor on the Work, provided that a release of liens and claims has been received from the Contractor pursuant to Civil Code section 8136. In the event of a dispute between the City and the Contractor, the City may withhold from the final payment an amount not to exceed 150% of the disputed amount.
- E. Contractor shall sign and submit Form CC4 - Final Release Form, with its final payment request.
- F. Within ten (10) calendar days from the time that all or any portion of the retention proceeds are received by Contractor, Contractor shall pay each of its subcontractors from whom retention has been withheld each subcontractor's share of the retention received. However, if a retention payment received by Contractor is specifically designated for a particular subcontractor, payment of the retention shall be made to the designated subcontractor if the payment is consistent with the terms of the subcontract.

**1.46 OCCUPANCY**

- A. The City reserves the right to occupy or utilize any portion of the Work at any time before completion, and such occupancy or use shall not constitute acceptance of any part of Work covered by this Contract. This use shall not relieve the Contractor of its responsibilities under the Contract.

**1.47 INDEMNIFICATION**

- A. To the fullest extent permitted by law, Contractor shall immediately defend (with counsel of the City's choosing), indemnify and hold harmless the City, officials, officers, agents, employees, and representatives, and each of them from and against:
1. Any and all claims, demands, causes of action, costs, expenses, injuries, losses or liabilities, in law or in equity, of every kind or nature whatsoever, but not limited to, injury to or death, including wrongful death, of any person, and damages to or destruction of property of any person, arising out of, related to, or in any manner directly or indirectly connected with the Work or this Contract, including claims made by subcontractors for nonpayment, including without limitation the payment of all consequential damages and attorney's fees and other related costs and expenses, however caused, regardless of whether the allegations are false, fraudulent, or groundless, and regardless of any negligence of the City or its officers, employees, or authorized volunteers (including passive negligence), except the sole negligence or willful misconduct or active negligence of the City or its officials, officers, employees, or authorized volunteers.
  2. Contractor's defense and indemnity obligation herein includes, but is not limited to damages, fines, penalties, attorney's fees and costs arising from claims under the Americans with Disabilities Act (ADA) or other federal or state disability access or discrimination laws arising from Contractor's Work during the course of construction of the improvements or after the Work is complete, as the result of defects or negligence in Contractor's construction of the improvements.
  3. Any and all actions, proceedings, damages, costs, expenses, fines, penalties or liabilities, in law or equity, of every kind or nature whatsoever, arising out of, resulting from, or on account of the violation of any governmental law or regulation, compliance with which is the responsibility of Contractor;
  4. Any and all losses, expenses, damages (including damages to the Work itself), attorney's fees, and other costs, including all costs of defense which any of them may incur with respect to the failure, neglect, or refusal of Contractor to faithfully perform the Work and all of Contractor's obligations under the agreement. Such costs, expenses, and damages shall include all costs, including attorney's fees, incurred by the indemnified parties in any lawsuit to which they are a party.
- B. Contractor shall immediately defend, at Contractor's own cost, expense and risk, any and all such aforesaid suits, actions or other legal proceedings of every kind that may be brought or instituted against the City, its officials, officers, agents, employees and representatives. Contractor shall pay and satisfy any judgment, award or decree that may be rendered against the City, its officials, officers, employees, agents, employees and representatives, in any such suit, action or other legal proceeding. Contractor shall reimburse the City, its officials, officers, agents, employees and representatives for any and all legal expenses and costs incurred by each of them in connection therewith or in enforcing the indemnity herein provided. The only limitations on this provision shall be those imposed by Civil Code section 2782.

#### 1.48 PROCEDURE FOR RESOLVING DISPUTES

Contractor shall timely comply with all notices and requests for changes to the Contract Time or Contract Price, including but not limited to all requirements of Section 1.44, Changes and Extra Work, as a prerequisite to filing any claim governed by this Section. The failure to timely submit a notice of delay or notice of change, or to timely request a change to the Contract Price or Contract Time, or to timely provide any other notice or request required herein shall constitute a waiver of the right to further pursue the claim under the Contract or at law.

- A. **Intent.** Effective January 1, 1991, Section 20104 et seq., of the California Public Contract Code prescribes a process utilizing informal conferences, non-binding judicial supervised mediation, and judicial arbitration to resolve disputes on construction claims of \$375,000 or less. Effective January 1, 2017, Section 9204 of the Public Contract Code prescribes a process for negotiation and mediation to resolve disputes on construction claims. The intent of this Section is to implement Sections 20104 et seq. and Section 9204 of the California Public Contract Code. This Section shall be construed to be consistent with said statutes.
- B. **Claims.** For purposes of this Section, "Claim" means a separate demand by the Contractor, after a change order duly requested in accordance with Section 1.44 "Changes and Extra Work" has been denied by the City, for (A) a time extension, (B) payment of money or damages arising from Work done by or on behalf of the Contractor pursuant to the Contract, or (C) an amount the payment of which is disputed by the City. A "Claim" does not include any demand for payment for which the Contractor has failed to provide notice, request a change order, or otherwise failed to follow any procedures contained in the Contract Documents. Claims governed by this Section may not be filed unless and until the Contractor completes all procedures for giving notice of delay or change and for the requesting of a time extension or change order, including but not necessarily limited to the procedures contained in Section 1.44, Changes and Extra Work, and Contractor's request for a change has been denied in whole or in part. Claims governed by this Section must be filed no later than fourteen (14) days after a request for change has been denied in whole or in part or after any other event giving rise to the Claim. The Claim shall be submitted in writing to the City and shall include on its first page the following in 16 point capital font: "THIS IS A CLAIM." Furthermore, the claim shall include the documents necessary to substantiate the claim. Nothing herein is intended to extend the time limit or supersede notice requirements otherwise provided by contract for the filing of claims, including all requirements pertaining to compensation or payment for extra Work, disputed Work, and/or changed conditions. Failure to follow such contractual requirements shall bar any claims or subsequent lawsuits for compensation or payment thereon.
- C. **Supporting Documentation.** The Contractor shall submit all claims in the following format:
  - 1. Summary of claim merit and price, reference Contract Document provisions pursuant to which the claim is made
  - 2. List of documents relating to claim:
    - a. Specifications
    - b. Drawings
    - c. Clarifications (Requests for Information)
    - d. Schedules
    - e. Other
  - 3. Chronology of events and correspondence
  - 4. Analysis of claim merit
  - 5. Analysis of claim cost
  - 6. Time impact analysis in CPM format



7. If Contractor's claim is based in whole or in part on an allegation of errors or omissions in the Drawings or Specifications for the Project, Contractor shall provide a summary of the percentage of the claim subject to design errors or omissions and shall obtain a certificate of merit in support of the claim of design errors and omissions.
  8. Cover letter and certification of validity of the claim, including any claims from subcontractors of any tier, in accordance with Government Code section 12650 *et seq.*
- D. **City's Response.** Upon receipt of a claim pursuant to this Section, City shall conduct a reasonable review of the claim and, within a period not to exceed 45 Days, shall provide the Contractor a written statement identifying what portion of the claim is disputed and what portion is undisputed. Any payment due on an undisputed portion of the claim will be processed and made within 60 Days after the City issues its written statement.
1. If the City needs approval from its governing body to provide the Contractor a written statement identifying the disputed portion and the undisputed portion of the claim, and the City's governing body does not meet within the 45 Days or within the mutually agreed to extension of time following receipt of a claim sent by registered mail or certified mail, return receipt requested, the City shall have up to three Days following the next duly publicly noticed meeting of the City's governing body after the 45-Day period, or extension, expires to provide the Contractor a written statement identifying the disputed portion and the undisputed portion.
  2. Within 30 Days of receipt of a claim, the City may request in writing additional documentation supporting the claim or relating to defenses or claims the City may have against the Contractor. If additional information is thereafter required, it shall be requested and provided pursuant to this subdivision, upon mutual agreement of City and the Contractor. The City's written response to the claim, as further documented, shall be submitted to the Contractor within 30 Days (if the claim is less than \$15,000, within 15 Days) after receipt of the further documentation, or within a period of time no greater than that taken by the Contractor in producing the additional information or requested documentation, whichever is greater.
- E. **Meet and Confer.** If the Contractor disputes the City's written response, or the City fails to respond within the time prescribed, the Contractor may so notify the City, in writing, either within 15 Days of receipt of the City's response or within 15 Days of the City's failure to respond within the time prescribed, respectively, and demand in writing an informal conference to meet and confer for settlement of the issues in dispute. Upon receipt of a demand, the City shall schedule a meet and confer conference within 30 Days for settlement of the dispute.
- F. **Mediation.** Within 10 business Days following the conclusion of the meet and confer conference, if the claim or any portion of the claim remains in dispute, the City shall provide the Contractor a written statement identifying the portion of the claim that remains in dispute and the portion that is undisputed. Any payment due on an undisputed portion of the claim shall be processed and made within 60 Days after the City issues its written statement. Any disputed portion of the claim, as identified by the Contractor in writing, shall be submitted to nonbinding mediation, with the City and the Contractor sharing the associated costs equally. The City and Contractor shall mutually agree to a mediator within 10 business Days after the disputed portion of the claim has been identified in writing, unless the parties agree to select a mediator at a later time.
1. If the parties cannot agree upon a mediator, each party shall select a mediator and those mediators shall select a qualified neutral third party to mediate with regard to the disputed portion of the claim. Each party shall bear the fees and costs charged by its respective mediator in connection with the selection of the neutral mediator.



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2. For purposes of this section, mediation includes any nonbinding process, including, but not limited to, neutral evaluation or a dispute review board, in which an independent third party or board assists the parties in dispute resolution through negotiation or by issuance of an evaluation. Any mediation utilized shall conform to the timeframes in this section.
  3. Unless otherwise agreed to by the City and the Contractor in writing, the mediation conducted pursuant to this section shall excuse any further obligation under Public Contract Code Section 20104.4 to mediate after litigation has been commenced.
  4. The mediation shall be held no earlier than the date the Contractor completes the Work or the date that the Contractor last performs Work, whichever is earlier. All unresolved claims shall be considered jointly in a single mediation, unless a new unrelated claim arises after mediation is completed.
- G. **Procedures After Mediation.** If following the mediation, the claim or any portion remains in dispute, the Contractor must file a claim pursuant to Chapter 1 (commencing with Section 900) and Chapter 2 (commencing with Section 910) of Part 3 of Division 3.6 of Title 1 of the Government Code prior to initiating litigation. For purposes of those provisions, the running of the period of time within which a claim must be filed shall be tolled from the time the Contractor submits his or her written claim pursuant to subdivision (a) until the time the claim is denied, including any period of time utilized by the meet and confer conference.
- H. **Civil Actions.** The following procedures are established for all civil actions filed to resolve claims of \$375,000 or less:
1. Within 60 Days, but no earlier than 30 Days, following the filing or responsive pleadings, the court shall submit the matter to non-binding mediation unless waived by mutual stipulation of both parties or unless mediation was held prior to commencement of the action in accordance with Public Contract Code section 9204 and the terms of this Contract. The mediation process shall provide for the selection within 15 Days by both parties of a disinterested third person as mediator, shall be commenced within 30 Days of the submittal, and shall be concluded within 15 Days from the commencement of the mediation unless a time requirement is extended upon a good cause showing to the court.
  2. If the matter remains in dispute, the case shall be submitted to judicial arbitration pursuant to Chapter 2.5 (commencing with Section 1141.10) of Title 3 of Part 3 of the Code of Civil Procedure, notwithstanding Section 1114.11 of that code. The Civil Discovery Act of 1986 (Article 3 (commencing with Section 2016) of Chapter 3 of Title 3 of Part 4 of the Code of Civil Procedure) shall apply to any proceeding brought under this subdivision consistent with the rules pertaining to judicial arbitration. In addition to Chapter 2.5 (commencing with Section 1141.10) of Title 3 of Part 3 of the Code of Civil Procedure, (A) arbitrators shall, when possible, be experienced in construction law, and (B) any party appealing an arbitration award who does not obtain a more favorable judgment shall, in addition to payment of costs and fees under that chapter, also pay the attorney's fees on appeal of the other party.





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- I. **Government Code Claims.** In addition to any and all contract requirements pertaining to notices of and requests for compensation or payment for extra Work, disputed Work, construction claims and/or changed conditions, the Contractor must comply with the claim procedures set forth in Government Code Sections 900, et seq. prior to filing any lawsuit against the City. Such Government Code claims and any subsequent lawsuit based upon the Government Code claims shall be limited to those matters that remain unresolved after all procedures pertaining to extra Work, disputed Work, construction claims, and/or changed conditions have been followed by Contractor. If no such Government Code claim is submitted, or if the prerequisite contractual requirements are not satisfied, no action against the City may be filed. **A Government Code claim must be filed no earlier than the date the Work is completed or the date the Contractor last performs Work on the Project, whichever occurs first. A Government Code claim shall be inclusive of all unresolved claims unless a new unrelated claim arises after the Government Code claim is submitted**
- J. **Non-Waiver.** The City's failure to respond to a claim from the Contractor within the time periods described in this Section or to otherwise meet the time requirements of this Section shall result in the claim being deemed rejected in its entirety.

**1.49 CITY'S RIGHT TO TERMINATE CONTRACT**

**A. Termination for Cause by the City:**

1. In the sole estimation of the City, if the Contractor refuses or fails to prosecute the Work or any separable part thereof with such diligence as will insure its completion within the time specified by the Contract Documents, or any extension thereof, or fails to complete such Work within such time, or if the Contractor should be adjudged a bankrupt, or if it should make a general assignment for the benefit of its creditors, or if a receiver should be appointed on account of its insolvency, or the Contractor or any of its subcontractors should violate any of the provisions of this Contract, the City may serve written notice upon the Contractor and its Surety of the City's intention to terminate this Contract. This notice of intent to terminate shall contain the reasons for such intention to terminate this Contract, and a statement to the effect that the Contractor's right to perform this Contract shall cease and terminate upon the expiration of ten (10) calendar days unless such violations have ceased and arrangements satisfactory to the City have been made for correction of said violations.
2. In the event that the City serves such written notice of termination upon the Contractor and the Surety, the Surety shall have the right to take over and perform the Contract. If the Surety does not: (1) give the City written notice of Surety's intention to take over and commence performance of the Contract within 15 calendar days of the City's service of said notice of intent to terminate upon Surety; and (2) actually commence performance of the Contract within 30 calendar days of the City's service of said notice upon Surety; then the City may take over the Work and prosecute the same to completion by separate contract or by any other method it may deem advisable for the account and at the expense of the Contractor.

3. In the event that the City elects to obtain an alternative performance of the Contract as specified above: (1) the City may, without liability for so doing, take possession of and utilize in completion of the Work such materials, appliances, plants and other property belonging to the Contractor that are on the site and reasonably necessary for such completion (A special lien to secure the claims of the City in the event of such suspension is hereby created against any property of Contractor taken into the possession of the City under the terms hereof and such lien may be enforced by sale of such property under the direction of the City without notice to Contractor. The proceeds of the sale after deducting all expenses thereof and connected therewith shall be credited to Contractor. If the net credits shall be in excess of the claims of the City against Contractor, the balance will be paid to Contractor or Contractor's legal representatives.); and (2) Surety shall be liable to the City for any cost or other damage to the City necessitated by the City securing an alternate performance pursuant to this Section.

**B. Termination for Convenience by the City:**

1. The City may terminate performance of the Work called for by the Contract Documents in whole or, from time to time, in part, if the City determines that a termination is in the City's interest.
2. The Contractor shall terminate all or any part of the Work upon delivery to the Contractor of a Notice of Termination specifying that the termination is for the convenience of the City, the extent of termination, and the Effective Date of such termination.
3. After receipt of Notice of Termination, and except as directed by the City's Representative, the Contractor shall, regardless of any delay in determining or adjusting any amounts due under this Termination for Convenience clause, immediately proceed with the following obligations:
  - a. Stop Work as specified in the Notice.
  - b. Complete any Work specified in the Notice of Termination in a least cost/shortest time manner while still maintaining the quality called for under the Contract Documents.
  - c. Leave the property upon which the Contractor was working and upon which the facility (or facilities) forming the basis of the Contract Document is situated in a safe and sanitary manner such that it does not pose any threat to the public health or safety.
  - d. Terminate all subcontracts to the extent that they relate to the portions of the Work terminated.
  - e. Place no further subcontracts or orders, except as necessary to complete the continued portion of the Contract.
  - f. Submit to the City's Representative, within ten (10) calendar days from the Effective Date of the Notice of Termination, all of the usual documentation called for by the Contract Documents to substantiate all costs incurred by the Contractor for labor, materials and equipment through the Effective Date of the Notice of Termination. Any documentation substantiating costs incurred by the Contractor solely as a result of the City's exercise of its right to terminate this Contract pursuant to this clause, which costs the contractor is authorized under the Contract documents to incur, shall: (1) be submitted to and received by the Architect no later than 30 calendar days after the Effective Date of the Notice of Termination; (2) describe the costs incurred with particularity; and (3) be conspicuously identified as "Termination Costs occasioned by the City's Termination for Convenience."
4. Termination of the Contract shall not relieve Surety of its obligation for any just claims arising out of or relating to the Work performed.

5. In the event that the City exercises its right to terminate this Contract pursuant to this clause, the City shall pay the Contractor, upon the Contractor's submission of the documentation required by this clause and other applicable provisions of the Contract Documents, the following amounts:
  - a. All actual reimbursable costs incurred according to the provisions of this Contract.
  - b. A reasonable allowance for profit on the cost of the Work performed, provided Contractor establishes to the satisfaction of the City's Representative that it is reasonably probable that Contractor would have made a profit had the Contract been completed and provided further, that the profit allowed shall in no event exceed fifteen (15%) percent of the costs.
  - c. A reasonable allowance for Contractor's administrative costs in determining the amount payable due to termination of the Contract under this Section.
- C. Notwithstanding any other provision of this Section, when immediate action is necessary to protect life and safety or to reduce significant exposure or liability, the City may immediately order Contractor to cease Work on the Project until such safety or liability issues are addressed to the satisfaction of the City or the Contract is terminated.

**1.50 WARRANTY AND GUARANTEE OF WORK**

- A. Contractor hereby warrants that materials and Work shall be completed in conformance with the Contract Documents and that the materials and Work provided will fulfill the requirements of this Warranty. Contractor hereby agrees to repair or replace, at the discretion of the City, any or all Work that may prove to be defective in its workmanship, materials furnished, methods of installation or fail to conform to the Contract Document requirements together with any other Work which may be damaged or displaced by such defect(s) within a period of one (1) year from the date of the Notice of Completion of the Project without any expense whatever to the City, ordinary wear and tear and unusual abuse and neglect excepted. Contractor shall be required to promptly repair or replace defective equipment or materials, at Contractor's option. All costs associated with such corrective actions and testing, including the removal, replacement, and reinstitution of equipment and materials necessary to gain access, shall be the sole responsibility of the Contractor.
- B. For any Work so corrected, Contractor's obligation hereunder to correct defective Work shall be reinstated for an additional one (1) year period, commencing with the date of acceptance of such corrected Work. The reinstatement of the one (1) year warranty shall apply only to that portion of work that was corrected. Contractor shall perform such tests as City may require to verify that any corrective actions, including, without limitation, redesign, repairs, and replacements comply with the requirements of the Contract. In the event of Contractor's failure to comply with the above- mentioned conditions within ten (10) calendar days after being notified in writing of required repairs, to the reasonable satisfaction of the City, the City shall have the right to correct and replace any defective or non-conforming Work and any work damaged by such work or the replacement or correction thereof at Contractor's sole expense. Contractor shall be obligated to fully reimburse the City for any expenses incurred hereunder immediately upon demand.

- C. In addition to the warranty set forth in this Section, Contractor shall obtain for City all warranties that would be given in normal commercial practice and assign to City any and all manufacturer's or installer's warranties for equipment or materials not manufactured by Contractor and provided as part of the Work, to the extent that such third-party warranties are assignable and extend beyond the warranty period set forth in this Section. Contractor shall furnish the City with all warranty and guarantee documents prior to final Acceptance of the Project by the City as required.
- D. When specifically indicated in the Contract Documents or when directed by the Architect, the City may furnish materials or products to the Contractor for installation. In the event any act or failure to act by Contractor shall cause a warranty applicable to any materials or products purchased by the City for installation by the Contractor to be voided or reduced, Contractor shall indemnify City from and against any cost, expense, or other liability arising therefrom, and shall be responsible to the City for the cost of any repairs, replacement or other costs that would have been covered by the warranty but for such act or failure to act by Contractor.
- E. The Contractor shall remedy at its expense any damage to City-owned or controlled real or personal property.
- F. The City shall notify the Contractor, in writing, within a reasonable time after the discovery of any failure, defect, or damage. The Contractor shall within ten (10) calendar days after being notified commence and perform with due diligence all necessary Work. If the Contractor fails to promptly remedy any defect, or damage; the City shall have the right to replace, repair or otherwise remedy the defect, or damage at the Contractor's expense.
- G. In the event of any emergency constituting an immediate hazard to health, safety, property, or licensees, when caused by Work of the Contractor not in accordance with the Contract requirements, the City may undertake at Contractor's expense, and without prior notice, all Work necessary to correct such condition.
- H. Acceptance of Defective Work.
  - 1. If, instead of requiring correction or removal and replacement of Defective Work, the City prefers to accept it, City may do so. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) attributable to City's evaluation of and determination to accept such Defective Work and for the diminished value of the Work.
  - 2. If any acceptance of defective work occurs prior to release of the Project Retention, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and City shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of Work and all costs incurred by City.
  - 3. If the Project Retention is held in an escrow account as permitted by the Contract Documents, Contractor will promptly alert the escrow holder, in writing, of the amount of Retention to be paid to City.
  - 4. If the acceptance of Defective Work occurs after release of the Project Retention, an appropriate amount will be paid by Contractor to City.
- I. City May Correct Defective Work.
  - 1. If Contractor fails within a reasonable time after written notice from City's Representative to correct Defective Work, or to remove and replace rejected Work as required by City, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, City may, after seven (7) Days' written notice to Contractor, correct, or remedy any such deficiency.

2. In connection with such corrective or remedial action, City may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, take possession of Contractor's tools, appliances, construction equipment and machinery at the Site, and incorporate in the Work all materials and equipment stored at the Site or for which City has paid Contractor but which are stored elsewhere. Contractor shall allow City and City's Representative, and the agents, employees, other contractors, and consultants of each of them, access to the Site to enable City to exercise the rights and remedies to correct the Defective Work.
3. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred or sustained by City correcting the Defective Work will be charged against Contractor, and a Change Order will be issued incorporating the necessary revisions into the Contract Documents with respect to the Work; and City shall be entitled to an appropriate decrease in the Contract Price.
4. Such claims, costs, losses and damages will include, but not be limited to, all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Defective Work.
5. If the Change Order is executed after all payments under the Contract have been paid by City and the Project Retention is held in an escrow account as permitted by the Contract Documents, Contractor will promptly alert the escrow holder, in writing, of the amount of Retention to be paid to City.
6. If the Change Order is executed after release of the Project Retention, an appropriate amount will be paid by Contractor to City.
7. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to City correcting Defective work.
- J. Nothing in the Warranty or in the Contract Documents shall be construed to limit the rights and remedies available to City at law or in equity, including, but not limited to, Code of Civil Procedure section 337.15.

#### **1.51 DOCUMENT RETENTION & EXAMINATION**

- A. In accordance with Government Code section 8546.7, records of both the City and the Contractor shall be subject to examination and audit by the State Auditor General for a period of three (3) years after final payment.
- B. Contractor shall make available to the City any of the Contractor's other documents related to the Project immediately upon request of the City.
- C. In addition to the State Auditor rights above, the City shall have the right to examine and audit all books, estimates, records, contracts, documents, bid documents, subcontracts, and other data of the Contractor (including computations and projections) related to negotiating, pricing, or performing the modification in order to evaluate the accuracy and completeness of the cost or pricing data at no additional cost to the City, for a period of four (4) years after final payment.

#### **1.52 SEPARATE CONTRACTS**

- A. The City reserves the right to let other contracts in connection with this Work or on the Project site. Contractor shall permit other contractors reasonable access and storage of their materials and execution of their work and shall properly connect and coordinate its Work with theirs.
- B. To ensure proper execution of its subsequent Work, Contractor shall immediately inspect work already in place and shall at once report to the Architect any problems with the Work in place or discrepancies with the Contract Documents.

- C. Contractor shall ascertain to its own satisfaction the scope of the Project and nature of any other contracts that have been or may be awarded by the City in prosecution of the Project to the end that Contractor may perform this Contract in the light of such other contracts, if any. Nothing herein contained shall be interpreted as granting to Contractor exclusive occupancy at site of the Project. Contractor shall not cause any unnecessary hindrance or delay to any other contractor working on the Project. If simultaneous execution of any contract for the Project is likely to cause interference with performance of some other contract or contracts, the Architect shall decide which Contractor shall cease Work temporarily and which contractor shall continue or whether work can be coordinated so that contractors may proceed simultaneously. The City shall not be responsible for any damages suffered or for extra costs incurred by Contractor resulting directly or indirectly from award, performance, or attempted performance of any other contract or contracts on the Project site.

**1.53 NOTICE AND SERVICE THEREOF**

- A. All notices shall be in writing and either served by personal delivery or mailed to the other party as designated in the Bid Forms. Written notice to the Contractor shall be addressed to Contractor's principal place of business unless Contractor designates another address in writing for service of notice. Notice to City shall be addressed to the City as designated in the Notice Inviting Bids unless City designates another address in writing for service of notice. Notice shall be effective upon receipt or five (5) calendar days after being sent by first class mail, whichever is earlier. Notice given by facsimile shall not be effective unless acknowledged in writing by the receiving party.

**1.54 NOTICE OF THIRD-PARTY CLAIMS**

- A. Pursuant to Public Contract Code section 9201, the City shall provide the Contractor with timely notification of the receipt of any third-party claims relating to the Contract. The City is entitled to recover reasonable costs incurred in providing such notification.

**1.55 STATE LICENSE BOARD NOTICE**

- A. Contractors are required by law to be licensed and regulated by the Contractors' State License Board which has jurisdiction to investigate complaints against contractors if a complaint regarding a patent act or omission is filed within four (4) years of the date of the alleged violation. A complaint regarding a latent act or omission pertaining to structural defects must be filed within ten (10) years of the date of the alleged violation. Any questions concerning a contractor may be referred to the Registrar, Contractors' State License Board, P.O. Box 26000, Sacramento, California 95826.

**1.56 INTEGRATION**

- A. **Oral Modifications Ineffective.** No oral order, objection, direction, claim or notice by any party or person shall affect or modify any of the terms or obligations contained in the Contract Documents.
- B. **Contract Documents Represent Entire Contract.** The Contract Documents represent the entire agreement of the City and Contractor.





**SECTION 00 72 00  
GENERAL CONDITIONS**

**DIVISION 00**

**1.57 ASSIGNMENT OF CONTRACT**

- A. Contractor shall not assign, transfer, convey, sublet or otherwise dispose of the rights or title of interest of any or all of this contract without the prior written consent of the City. Any assignment or change of Contractor's name of legal entity without the written consent of the City shall be void. Any assignment of money due or to become due under this Contract shall be subject to a prior lien for services rendered or Material supplied for performance of Work called for under the Contract Documents in favor of all persons, firms, or corporations rendering such services or supplying such Materials to the extent that claims are filed pursuant to the Civil Code, the Code of Civil Procedure or the Government Code.

**1.58 CHANGE IN NAME AND NATURE OF CONTRACTOR'S LEGAL ENTITY**

- A. Should a change be contemplated in the name or nature of the Contractor's legal entity, the Contractor shall first notify the City in order that proper steps may be taken to have the change reflected on the Contract and all related documents. No change of Contractor's name or nature will affect City's rights under the Contract, including but not limited to the bonds.

**1.59 ASSIGNMENT OF ANTITRUST ACTIONS**

- A. Pursuant to Public Contract Code section 7103.5, in entering into a public works contract or subcontract to supply goods, services, or materials pursuant to a public works contract, Contractor or subcontractor offers and agrees to assign to the City all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 USC, Section 15) or under the Cartwright Act (Chapter 2 (commencing with Section 16700) of Part 2 of Division 7 of the Business and Professions Code), arising from the purchase of goods, services, or materials pursuant to this contract or any subcontract. This assignment shall be made and become effective at the time the City tenders final payment to the Contractor, without further acknowledgment by the parties.

**1.60 PROHIBITED INTERESTS**

- A. No City official or representative who is authorized in such capacity and on behalf of the City to negotiate, supervise, make, accept, or approve, or to take part in negotiating, supervising, making, accepting or approving any engineering, inspection, construction or material supply contract or any subcontract in connection with construction of the project, shall be or become directly or indirectly interested financially in the Contract.

**1.61 CONTROLLING LAW**

- A. Notwithstanding any subcontract or other contract with any subcontractor, supplier, or other person or organization performing any part of the Work, this Contract shall be governed by the law of the State of California, excluding any choice of law provisions.

**1.62 JURISDICTION; VENUE**

- A. Contractor and any subcontractor, supplier, or other person or organization performing any part of the Work agrees that any action or suits at law or in equity arising out of or related to the bidding, award, or performance of the Work shall be maintained in the Superior Court of Santa Barbara County, California, and expressly consent to the jurisdiction of said court, regardless of residence or domicile, and agree that said court shall be a proper venue for any such action.



**SECTION 00 72 00  
GENERAL CONDITIONS**

**DIVISION 00**

**1.63 LAWS AND REGULATIONS**

- A. Contractor shall give all notices and comply with all laws, ordinances, rules and regulations bearing on conduct of work as indicated and specified. If Contractor observes that drawings and specifications are at variance therewith, it shall promptly notify the Architect in writing and any necessary changes shall be adjusted as provided for in this Contract for changes in work. If Contractor performs any work knowing it to be contrary to such laws, ordinances, rules and regulations, and without such notice to the Architect, it shall bear all costs arising therefrom.
- B. Contractor shall be responsible for familiarity with the Americans with Disabilities Act ("ADA") (42 U.S.C. § 12101 et seq.). The Work will be performed in compliance with ADA regulations.

**1.64 PATENTS**

- A. Contractor shall hold and save the City, officials, officers, employees, and authorized volunteers harmless from liability of any nature or kind of claim therefrom including costs and expenses for or on account of any patented or unpatented invention, article or appliance manufactured, furnished or used by Contractor in the performance of this contract.

**1.65 OWNERSHIP OF CONTRACT DOCUMENTS**

- A. All Contract Documents furnished by the City are City property. They are not to be used by Contractor or any subcontractor on other work nor shall Contractor claim any right to such documents. With exception of one complete set of Contract Documents, all documents shall be returned to the City on request at completion of the Work.

**1.66 NOTICE OF TAXABLE POSSESSORY INTEREST**

- A. In accordance with Revenue and Taxation Code section 107.6, the Contract Documents may create a possessory interest subject to personal property taxation for which Contractor will be responsible.

**1.67 SURVIVAL OF OBLIGATIONS**

- A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

**1.68 RELATED REQUIREMENTS**

- A. Section 01 33 00 - Submittal Procedures
- B. Section 00 73 00 - Special Conditions.
- C. Section 01 25 13 - Product Procedures For Substitution And "Or Equal"

**SUPPLEMENTARY CONDITIONS**

**2.01 REFER TO DOCUMENT 00 73 00 - SPECIAL CONDITIONS FOR AMENDMENTS TO THESE GENERAL CONDITIONS.**

**END OF SECTION**



**SECTION 00 73 00  
SPECIAL CONDITIONS**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. These Special Conditions amend and supplement the General Conditions defined in Document 00 72 00 - General Conditions and other provisions of Contract Documents as indicated below. Provisions that are not so amended or supplemented remain in full force and effect.
- B. The terms used in these Supplementary (Special) Conditions that are defined in the General Conditions have the meanings assigned to them in the General Conditions.

**PART 2 MODIFICATIONS TO GENERAL CONDITIONS**

**2.01 ARCHITECT OF RECORD.**

- A. For purposes of this Project, the Architect of Record or Architect for Jeffrey Miller Architecture and Design [JM+AD] is Jeffrey Miller, AIA.

**2.02 DESIGNATION OF CITY'S REPRESENTATIVE.**

- A. Unless otherwise modified by the City, the City's Representative shall be Matthew R. Fore, General Services Director.

**2.03 LOCATION OF THE PROJECT.**

- A. The Project is located at 500 North Fairview Avenue, Goleta, California, 93117 (Project Site).

**2.04 STATUS OF THE PROJECT AREA AND RIGHTS-OF-WAY.**

- A. City, at its expense, will provide all rights-of-way or permits, or both, covering the crossing of private property and public and private rights-of-way necessary for the permanent Work; provided, however, Contractor shall, at its expense, obtain any bonds or insurance policies or pay any fees and enter into any agreements required by a controlling authority, e.g., Caltrans, Goleta Water District, ect. before Contractor enters upon any property or right-of-way under the jurisdiction of any such controlling authority for the purpose of performing Work.
- B. City has acquired or is negotiating to acquire any rights-of-way, or both, necessary for the permanent Work.
- C. If such permits are required, all operations of the Contractor shall conform to the restrictions, regulations, and requirements set forth in said permits, copies of which will be included in the Contract Documents.
- D. Contractor may be required, as a condition for receiving final payment, to obtain, and provide City's Representative with copies of, executed damage releases from the owners of public and private property whose property has been damaged by the Work. The damage releases will be on a form provided by City.
- E. Contractor shall, also, as a condition for receiving final payment, obtain, and provide City's Representative with copies of, executed damage releases from the owners of certain public and private property or areas which have been crossed by the Work or otherwise affected by the Work. The damage releases will be on a form provided by City.

**2.05 MODIFICATION OF HOURS OF WORK.**

- A. Pursuant to Chapter 17.39 of the Goleta Municipal Code, construction hours are limited to 8:00 a.m. to 5:00 p.m. Monday through Friday. Contractor may request a modification to construction hours from the City.

**2.06 PROJECT RETENTION**

- A. In accordance with Public Contract Code § 7201, City will withhold 5% of each progress payment as retention on the Project.

**2.07 CONTRACT TIME**

- A. The Contract Time shall commence on the date established in the Notice to Proceed. The Contractor shall have 396 calendar days to complete all work called for in the Contract Documents.

**2.08 LIQUIDATED DAMAGES DUE TO CONTRACTOR DELAY.**

- A. Time is of the essence. Should Contractor fail to complete all or any part of the Work within the time specified in the Contract Documents, City will suffer damage, the amount of which is difficult, if not impossible, to ascertain and, pursuant to the authority of Government Code section 53069.85, City shall therefore be entitled to **\$3,000 per Day** as liquidated damages for each Day or part thereof that actual completion extends beyond the time specified.
- B. Liquidated damages may be deducted from progress payments due Contractor, Project retention or may be collected directly from Contractor, or from Contractor's surety. These provisions for liquidated damages shall not prevent City, in case of Contractor's default, from terminating the Contractor.

**2.09 REVERSE LIQUIDATED DAMAGES DUE TO UNREASONABLE CITY DELAY.**

- A. In compliance with the provisions of California Public Contract Code § 7102, the Contractor will be compensated for damages incurred due to delays in completing the Work due solely to the fault of the City, where such delay is unreasonable under the circumstances and not contemplated by the parties and such delay is not the result of Additional Work. The Contractor and City agree that determining actual damages is impracticable and extremely difficult. As such, the Contractor shall be entitled to the appropriate time extension and to payment of liquidated damages in the sum of \$1,200 per Day of delay in excess of the time specified for the Completion of the Work. Such amount shall constitute the only payment allowed and shall necessarily include all overhead (direct or indirect), all profit, all administrative costs, all bond costs, all labor, materials, equipment and rental costs, and any other costs, expenses and fees incurred or sustained as a result of such delay. The Contractor expressly agrees to be limited solely to the liquidated damages for all such delays as defined in this subsection.

**2.10 UTILITY OUTAGES – NOTICES TO RESIDENTS.**

- A. Should Contractor's operations require interruption of any utility service, Contractor shall notify City at least ten (10) Days prior to the scheduled outage. Contractor will notify all impacted residents on a form provided by City at least seven (7) Days prior to the scheduled outage.
- B. Contractor shall be responsible for providing, at its cost, any temporary utility or facilities necessitated by the utility outage.

**2.11 NOISE RESTRICTIONS**

- A. Contractor shall comply with noise restrictions set forth in Chapter 17.39 of the Goleta Municipal Code.
- B. Contractor shall use only such equipment on the Work and in such state of repair so that the emission of sound therefrom is within the noise tolerance level of that equipment as established by Cal/OSHA.
- C. Contractor shall comply with the most restrictive of the following: (1) local sound control and noise level rules, regulations and ordinances and (2) the requirements contained in these Contract Documents, including hours of operation requirements



**SECTION 00 73 00  
SPECIAL CONDITIONS**

**DIVISION 00**

- D. No internal combustion engine shall be operated on the Project without a muffler of the type recommended by the manufacturer. Should any muffler or other control device sustain damage or be determined to be ineffective or defective, the Contractor shall promptly remove the equipment and shall not return said equipment to the job until the device is repaired or replaced. Said noise and vibration level requirements shall apply to all equipment on the job or related to the job, including but not limited to, trucks, transit mixers or transit equipment that may or may not be owned by the Contractor.

**2.12 BUILDER'S RISK ["ALL RISK"].**

- A. City will provide Builder's Risk ["All Risk"] insurance as described in 00 72 00 General Conditions Section 1.38 (G) Builder's Risk [All Risk].

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION - NOT USED**

**END OF SECTION**

**SECTION 01 10 00  
GENERAL REQUIREMENTS**

**PART 1 - GENERAL**

**1.01 COORDINATION AND COOPERATION WITH OTHERS**

- A. During the course of the work to be performed under this contract, it is expected that public agencies, utility companies, and other contractors will be performing work in the immediate vicinity. The Contractor shall notify the other public agencies, utilities, and contractors affected at least five (5) working days prior to beginning construction. The Contractor under this contract shall schedule the work and coordinate his operation with others so as to minimize conflicts and interference between his operations and those of other contractors.
- B. Agencies that may be performing work in the immediate vicinity may include, but are not limited to:
  - 1. City of Goleta
  - 2. Goleta Water District
  - 3. Goleta Sanitary District
  - 4. Goleta West Sanitary District
  - 5. Southern California Edison (SCE)
  - 6. Frontier (Telephone)
  - 7. Santa Barbara Flood Control District
  - 8. Cox Communications
  - 9. Bay Alarm

**1.02 QUALITY CONTROL**

- A. The Contractor shall be responsible for verifying all dimensions in the field and shall check all field conditions continuously during construction.
- B. The Contractor shall inspect related and appurtenant work and shall report in writing to the OAR any conditions that may prevent proper completion of the work.
- C. The Work shall be conducted under the general observation of the OAR and shall be subject to intermittent or continuous inspection to assure strict compliance with the requirements of the Contract Documents.
- D. The work hereunder shall be under the general direction of the OAR, acting directly and through his or her authorized representatives. The presence of an inspector, however, shall not relieve the Contractor of the responsibility for the proper execution of the Work in accordance with all requirements of the Contract Documents. Compliance with Contract Documents is distinctly a duty of the Contractor and said duty shall not be avoided by any act or omission on the part of an inspector.
- E. All materials and articles furnished by the Contractor shall be subject to rigid inspection, and no material or articles shall be used in the Work until it has been inspected and accepted by the OAR.
- F. Unless otherwise specified, all sampling and testing shall be in accordance with the methods prescribed in the current standards of the ASTM or other specified published standards, as applicable to the class and nature of the article or materials considered.
- G. Samples and test specimens required under the Contract Documents shall be furnished by the Contractor and prepared for testing in ample time for the completion of the necessary tests and analyses before the subject materials or articles are to be used. The Contractor shall furnish all required test specimens at its own expense. The cost of any test which shows unsatisfactory results shall be borne by the Contractor.

- H. Whenever the Contractor is ready to backfill, bury, cast in concrete, hide, or otherwise cover or make inaccessible any work under the Contract, the Contractor shall notify the OAR not less than 24 hours in advance of beginning any such work so that the required inspections can be scheduled and performed. Failure of the Contractor to notify the OAR at least 24 hours in advance of any such work shall be reasonable cause for the OAR to require sufficient delay in the Contractor's schedule to allow time for such inspections and any remedial or corrective work required. All costs of such delays, including its impact or effect upon other portions of the Work shall be borne by the Contractor.

**1.03 PROTECTION OF EXISTING FACILITIES**

- A. All oil, gasoline, power, telephone, communication, gas, water, irrigation, sewer, and storm drain facilities, both underground and overhead, encountered along the line of the Work shall remain continuously in service during all the operations under the Contract, unless other arrangements satisfactory to the OAR are made with the owner of said facilities.
- B. Prior to any construction in the vicinity of existing underground facilities, the Contractor shall notify the Underground Service Alert agency and the authorized representatives of such utility owners or agencies not less than 3 days nor more than 7 days prior to construction so that a representative of said owners or agencies can be present during such work if they so desire.
- C. The right is reserved to the owners of public utilities and franchises to enter at any time upon any public street, alley, right-of-way, or easement for the purpose of making changes in their property made necessary by the Work of this Contract.
- D. The Contractor shall protect all existing utilities and improvements not designated for removal and shall restore damaged or temporarily relocated utilities and improvements to a condition equal to or better than they were prior to such damage or temporary relocation, all in accordance with requirements of the Contract Documents.
- E. The Contractor shall not perform any work that would affect oil, gas, sewer, or water pipelines, telephone, communications, or electric lines, fences or other structures, nor shall the Contractor enter upon the right-of-way involved until notified by the OAR that the necessary authorization has been secured from the proper party. After authorization has been obtained, the Contractor shall give said party due notice of its intention to begin work, and shall give said party convenient access and every facility for removing, shoring, supporting, or otherwise protecting such pipeline, line, or structure, and for replacing same.
- F. Existing utility lines that are discovered during excavation operations shall be protected from damage during excavation and backfilling and, if damaged, shall be immediately repaired by the Contractor. The Contractor shall take all possible precautions for the protection of unforeseen utility lines to provide for uninterrupted service and to provide such special protection as may be necessary. When utility lines that are to be removed are encountered, the Contractor shall notify the OAR a sufficient time in advance for the necessary measures to be taken to prevent interruption of service.

- G. In the event that the Contractor damages any existing utility lines that are not shown or the locations of which are not made known to the Contractor prior to excavation, a written report thereof shall be made immediately to the OAR. If directed by the OAR, repairs shall be made by the Contractor under the provisions for changes and extra work contained in the General Provisions. All costs of locating, repairing damage not due to failure of the Contractor to exercise reasonable care, and removing or relocating such utility facilities not shown in the Contract Documents with reasonable accuracy, and for equipment on the project which was actually working on that portion of the work which was interrupted or idled by removal or relocation of such utility facilities, and which was necessarily idled during such work will be paid for as extra work in accordance with the provisions of the General Provisions.
- H. The Contractor shall be responsible for and shall repair all damage caused by its operations even in the event such damage occurs after backfilling or is not discovered until after completion of the backfilling. All repairs to a damaged improvement are subject to inspection and approval by an authorized representative of the improvement owner before being concealed by backfill or other work.
- I. Where the proper completion of the Work requires the temporary or permanent removal and/or relocation of an existing utility or other improvement which is shown, the Contractor, without unnecessary delay, shall temporarily replace or relocate such utility or the facility. Restoration to former location shall be accomplished by the Contractor in a manner that will restore or replace the utility or improvement as nearly as possible to its former locations and to as good or better condition than found prior to removal.
- J. The Contractor shall not destroy, remove, or otherwise disturb any existing survey markers or other existing street or roadway markers without proper authorization. No pavement breaking or excavation shall be started until all survey or other permanent marker points that will be disturbed by the construction operations have been properly referenced for easy and accurate restoration. All survey markers or points disturbed by the Contractor shall be accurately restored by the Contractor at the Contractor's expense after all street or roadway resurfacing has been completed.
- K. All paved areas, including curbs and berms, cut or damaged during construction shall be replaced with similar materials and of equal thickness to match the existing adjacent undisturbed areas, except where specific resurfacing requirements have been called for in the Contract Documents or in the permit of the governing agency. All pavement restoration and other facilities restoration shall be constructed to finish grades compatible with adjacent undisturbed pavement.
  - 1. Wherever sidewalks, driveways, or private roads have been removed for purposes of construction, the Contractor shall place suitable temporary sidewalks or roadways promptly after backfilling and shall maintain them in satisfactory condition for the period of time fixed by the governing agency before proceeding with the final restoration or, if no such period of times is so fixed, the Contractor shall maintain temporary sidewalks or roadways until the final restoration has been made.

**1.04 POTHOLING AND LOCATING EXISTING UNDERGROUND FACILITIES**

- A. The Contractor shall notify Underground Service Alert (USA) at least 48 hours in advance of any construction or potholing and make arrangements for the existing utilities to be marked by the affected utility companies.

- B. The Contractor shall verify the exact location, depth, alignment, and grade of all utilities shown on the construction drawings and marked as part of the USA procedure. The Contractor shall make exploratory excavations (potholing) of all utilities that may interfere with the Work. All such exploratory excavations shall be performed as soon as practicable after award of contract and, in any event, a sufficient time in advance of construction to avoid possible delays to the Contractor's work. When such exploratory excavations show the utility location as shown to be in error, the Contractor shall immediately notify the OAR.
  - 1. The Contractor shall pothole and locate the existing underground utilities at locations where connections will be made to existing utilities or where proposed facilities cross existing utilities and as shown on the drawings prior to submitting shop drawings. The Contractor shall submit the pothole data to the OAR for review. The OAR will not review any submittals by the Contractor until the potholing is completed and the pothole data has been submitted to the OAR for review. No extension of time or additional compensation will be made for delays caused by the failure of the Contractor to complete the potholing in a timely manner.
- C. All costs incurred in exposing and locating the existing utilities including all labor, tools, equipment for excavation, backfill and restoring existing surface improvements, shall be borne by the Contractor. The Contractor shall bear the cost of repairing or replacing any existing utility damaged by his potholing work.

**1.05 TEMPORARY ENVIRONMENTAL CONTROLS**

- A. The use of explosives on the Work will NOT be permitted.
- B. The Contractor shall furnish all labor, equipment, and means required and shall carry out effective measures wherever and as often as necessary to prevent its operation from producing dust in amounts damaging to property, cultivated vegetation, or domestic animals, or causing a nuisance to persons living in or occupying buildings in the vicinity. The Contractor shall be responsible for any damage resulting from any dust originating from its operations. The Contractor's dust abatement measures shall be in accordance with the Santa Barbara County Air Pollution Control District standard dust mitigation measures and any other appropriate agency's dust abatement measures.
- C. During the progress of the Work, the Contractor shall keep the site of the Work and other areas used by it in a neat and clean condition, and free from any accumulation of rubbish. The Contractor shall dispose of all rubbish and waste materials of any nature occurring at the Work site, and shall establish regular intervals of collection and disposal of such materials and waste. The Contractor shall also keep its haul roads free from dirt, rubbish, and unnecessary obstructions resulting from its operations. Disposal of all rubbish and surplus materials shall be off the site of construction in accordance with all applicable laws and regulations.
- D. Fixed or portable chemical toilets shall be provided by the Contractor wherever needed for the use of employees. The Contractor shall establish a regular daily collection of all sanitary and organic wastes. All wastes and refuse from sanitary facilities provided by the Contractor or organic material wastes from any other source related to the Contractor's operations shall be disposed of away from the site in a manner satisfactory to the OAR and in accordance with all applicable laws and regulations.





**SECTION 01 10 00  
GENERAL REQUIREMENTS**

**DIVISION 01**

- E. The Contractor's attention is directed to the Federal Clean Water Act (1977) which requires a Corps of Engineers permit under Section 404 of the Act, for the discharge of one cubic yard or more of any dredged or fill material into "navigable waters" as defined in "Permits for Activities in Navigable Waters or Ocean Waters, Paragraph (d)(2), Federal Register of 25 July 1975, page 3134.
- F. All chemicals used during project construction or furnished for project operation, whether defoliant, soil sterilant, herbicide, pesticide, disinfectant, polymer, reactant or of other classification, shall show approval of either the U.S. Environmental Protection Agency or the U.S. Department of Agriculture. Use of all such chemicals and disposal of residues shall be in strict accordance with the printed instructions of the manufacturer.

**1.06 PERMANENT UTILITY SERVICES**

- A. Electrical power shall conform to the requirements of the serving utility companies and shall meet with the approval of local, state and national inspecting authorities. The Contractor shall verify the location of services and the serving utility company requirements.
- B. The Contractor shall apply for permanent electrical service in the name of the City of Goleta, and forward the service application to the General Manager for execution on behalf of the City. The City will pay all connection and cable charges or other charges levied by the utility. The Contractor shall have the sole responsibility for coordinating the service installation to ensure that service is available as required by the Contractor's schedule.
- C. The Contractor shall be responsible for all service charges until the facility is placed into service and final acceptance of the work is made by the City. All service charges, paid by the City prior to acceptance of the facility, will be deducted from the Contractor's progress or final payment.

**1.07 ELECTRICAL CONTINUITY TEST OF METAL PIPELINES**

- A. All metallic pipelines requiring joint bonding, including mortar lined and coated steel pipe (CML&C), shall be tested for electrical continuity upon completion of construction and prior to acceptance by the Goleta Water District. The Contractor shall pay for retesting of work not conforming to the Specifications and the Contract Drawings.

**1.08 COST OF OVERTIME INSPECTION AND OTHER SERVICES**

- A. Inspection of the work as well as other required services will be provided between the hours of 7:30 a.m. and 4:00 p.m. on Monday through Friday only except holidays. Any inspections or other services requested by or made necessary as a result of the actions of the Contractor beyond the hours stated above shall be paid for by the Contractor at the prevailing rate of 1-1/2 times the regular hourly rate plus equipment charges.
- B. Inspections or other services requested by or made necessary as a result of the actions of the Contractor on Saturdays, Sundays, or holidays, must be scheduled and approved and paid for by the Contractor in advance, at the prevailing rate for overtime and/or holiday work. The following holidays are observed: New Year's Day, Presidents Day, Memorial Day, Independence Day, Labor Day, Thanksgiving and Christmas. Contact the city or agency for specific dates and days holidays will be observed prior to scheduling any construction operations.
  - 1. The need for overtime inspection or other services shall be determined by the OAR, and his decision shall be final.





**SECTION 01 10 00  
GENERAL REQUIREMENTS**

**DIVISION 01**

**PART 2 - PRODUCTS NOT USED**

**PART 3 - EXECUTION NOT USED**

**PART 4 - MEASUREMENT AND PAYMENT**

**4.01 MEASUREMENT**

- A. All work performed under General Construction Requirements will not be measured for payment unless otherwise stated in the individual sections of these Technical Specifications.

**4.02 PAYMENT**

- A. Full compensation for work performed under General Requirements shall be considered as included in the contract price paid for the various other items of work, and no additional compensation will be allowed therefore unless otherwise stated in the individual sections of these Technical Specifications.

**END OF SECTION**

**SECTION 01 11 00  
SUMMARY OF WORK**

**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. The furnishing of all labor, materials, equipment, services, and incidentals necessary for Work of the Goleta Valley Library ADA, Safety, and Building Improvement Project, located at 500 North Fairview Avenue, Goleta, CA, 93117, as set forth in the Construction Documents, which include, but are not limited to, the Drawings, Addenda, and Specifications.

**1.02 RELATED REQUIREMENTS:**

- A. Section 01 23 00 - Alternates
- B. Section 01 50 00: Construction Facilities and Temporary Controls.
- C. Section 01 71 23: Field Engineering.

**1.03 FUTURE WORK**

- A. Contract for Additional Work: The Owner will award a separate contract for additional work to be performed at the site to be coordinated with the contractor prior to Substantial Completion. Completion of that work depends on the successful completion of preparatory work under this Contract. The Contract for future work includes the following:
- B. Work Defined in architectural drawings titled "Goleta Valley Library Supplemental Interiors Drawings"

**1.04 CONTRACTOR – ENGINEERED SYSTEMS**

- A. Performance and Design Criteria: Where professional engineering services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance, design criteria and quality assurance requirements indicated. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Contractor-Engineered Submittals: In addition to Shop Drawings, Calculations, Product Data, and other required submittals, submit a statement, signed and sealed by the responsible design professional, for each product, system and/or requirement specifically assigned to Contractor to be engineered 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. Submittals will be reviewed by Architect for Information Only. Architect may request clarification regarding Contractor-Engineered Submittals.

**1.05 SURVEYS, LINES AND LEVELS**

- A. Provide per 01 71 23 - Field Engineering.

**1.06 EXISTING CONDITIONS**

- A. Examination of the Site, Records of Existing Construction and Conditions: Examine the site, the records of existing construction and the conditions under which the Work is to be performed. Notify the Architect immediately if existing conditions discovered will effect the Work as shown on the Contract Documents

- B. Conditions Furnished in the Contract Documents: The Contract Documents are based upon the information furnished to the Architect by the Owner. Such information is available from the Owner. The records are furnished for information only and are not guaranteed to represent all conditions that will be encountered. The records of existing construction represent conditions known to the Owner. Other construction, of which no records are available, may be encountered. Dimensions of existing construction are based on data retrieved from existing contract documents created by the original base building architect and from information provided to the Architect by the Owner. The Contractor and each subcontractor shall field verify existing dimensions.
- C. The Contractor shall formulate its own conclusion as to the extent of such construction.
- D. Precautions Against Movement or Settlement: The Contractor shall take every precaution to guard against any movement or settlement of existing or new construction. Provide bracing, shoring, underpinning, or other retaining structures necessary in connection therewith. Assume responsibility for the design, safety, and support of such construction and for any movement, settlement, damage, or injury thereto.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION**

**3.01 USE OF PREMISES**

- A. Contractor shall coordinate the Work of all trades, Subcontractors, and utility service providers with the Owner and/or a Separate Work Contract. Contractor shall sequence, coordinate, and perform the Work to impose minimum hardship on the operation and use of the existing facilities and/or Project site. Contractor shall install all necessary protection for existing improvements, Project site, property, and new Work against dust, dirt, weather, damage, vandalism, and maintain and relocate all protection to accommodate progression of the Work.
- B. Contractor shall confine entrance and exiting to the Project site and/or facilities to routes designated by the OAR.
- C. Contractor shall utilize all available means to prevent generation of unnecessary noise and maintain noise levels to a minimum. When required by the OAR, Contractor shall immediately discontinue noise-generating activities and/or provide alternative methods to minimize noise generation. Contractor shall install and maintain air compressors, tractors, cranes, hoists, vehicles, and other internal combustion engine equipment with mufflers, including unloading cycle of compressors. Contractor shall discontinue operation of equipment producing objectionable noise as required by the OAR.
- D. Contractor shall furnish, install, and maintain adequate supports, shoring, and bracing to preserve structural integrity and prevent collapse of existing improvements and/or Work modified and/or altered as part of the Work.
- E. Contractor shall secure building entrances, exits, and Work areas with locking devices as required by the OAR.
- F. Contractor assumes custody and control of Owner property, both fixed and portable, remaining in existing facilities vacated during the Work.
- G. Contractor shall not use or allow anyone other than Owner employees to use facility telephones and/or other equipment, except in an emergency. Contractor shall reimburse Owner for telephone toll charges originating from the facility except those arising from emergencies or use by Owner employees.
- H. Contractor shall protect all surfaces, coverings, materials, and finished Work from damage. Mobile equipment shall be provided with pneumatic tires.



**SECTION 01 11 00  
SUMMARY OF WORK**

**DIVISION 01**

- I. Contractor is advised Owner may award Separate Work Contracts at this Project site.
- J. Contractor shall not permit the use of portable and/or fixed radio's or other types of sound producing devices including Bluetooth speakers and similar devices.

**END OF SECTION**

**SECTION 01 21 00  
ALLOWANCES**

**PART 1 - GENERAL**

**1.01 RELATED DOCUMENTS**

- A. General provisions of the contract documents, including general and supplementary conditions and all other specification sections, apply to this Section.

**1.02 DESCRIPTION**

- A. Section includes administrative and procedural requirements governing Allowances.
1. **Allowance #1: Miscellaneous Permit Allowance: \$5,000.**  
The City will pay for the City of Goleta Building Permit, Water Permit, and Fire Department Permit. While not anticipated, additional permits may be required.
  2. **Allowance #2: Southern California Edison Allowance: \$50,000.**  
The City will pay for the permits and fees associated with Southern California Edison (SCE) directly. While not anticipated, additional SCE scope of work and fees may be required.
  3. **Allowance #3: Fire Extinguishers and Fire Extinguisher Cabinets: \$5,000.**  
Allowance for the installation of fire extinguishers and cabinets as specified to be installed in locations as directed by the Fire Marshall. Assume (8) Fire Extinguishers will be required.
  4. Although included in the bid proposal price, allowances belong solely to the City and shall be expended only upon written direction by the City and/or Construction Manager, to be granted or denied in their sole Discretion.
  5. Allowances shall be included as a separate line item on the contractor's Schedule of values.
- B. Use the allowance only as directed by City and/or Construction Manager for City's purposes. Contractor shall submit an "allowance expenditure request" for each item, for review and approval prior to including in the monthly payment applications.
- C. Allowance includes cost of labor, materials, tools, equipment, ppe, supplies, removal, disposal, recycling, manifests, handling, transport, disposal, warranty, insurance, taxes, bonds, and contractor overhead and profit. Contractor's supervision and bond costs are included in the contract sum.
- D. Contractor Responsibilities include:
1. Assist Architect in selection of products, suppliers, and installers.
  2. Obtain proposals from suppliers and installers and offer recommendations.
  3. On notification of which products have been selected, execute purchase agreement with designated supplier and installer.
  4. Arrange for and process shop drawings, product data, and samples. Arrange for delivery.
  5. Promptly inspect products upon delivery for completeness, damage, and defects. Submit claims for transportation damage.



**SECTION 01 21 00  
ALLOWANCES**

**DIVISION 01**

- E. Although included in the base bid amount, the City controlled allowance belong solely to the City and shall be expended only upon written direction by the City, to be granted or denied in its sole discretion. Any portion of the City controlled allowance that upon final completion of the project and final payment has not been expended by City in the manner provided for herein shall be deemed to entirely accrue to and be retained by City, shall not be considered part of the contract sum payable and shall not be payable or owing to Contractor. Such unexpended funds shall furthermore not be considered, for purposes of California Civil Code Section 9138 to be money due or to become due to contractor nor as money payable to contractor or to any other person or entity under the terms of the performance bond or payment bond. Whenever the actual costs for an allowance item is more than or less than the stated City Controlled allowance amount, the contract price shall be adjusted accordingly by Change order and/or partial change order. The amount of the change order and/or partial change order shall reflect the difference between actual costs incurred by the contractor for the particular allowance item and its stated allowance amount.
- F. The establishment of a City controlled allowance shall not, under any circumstances, be interpreted as an express or implied promise, representation, or guarantee on the part of the City of the amount of compensable changes or compensable delay that will or are expected to occur, either of which may be substantially more or less than the amount of the City controlled allowance.

**1.03 INFORMATIONAL SUBMITTALS**

- A. Submit complete documentation to show actual quantities of materials abated and Legally disposed of, including transport costs, if any, as well as time sheets and Other documentation to show labor time and material (such as disposable items) Related to work that shall be charged against the allowance.
- B. Once an allowance expenditure amount has been approved by the City, no Additional costs for that specific item will be considered.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

**END OF SECTION**

**SECTION 01 23 00  
ALTERNATES**

**PART 1 - GENERAL**

**1.01 SECTION INCLUDES:**

- A. This Section specifies administrative and procedural requirements governing alternate bid items.

**1.02 RELATED REQUIREMENTS:**

- A. Section 00 21 13 - Instructions to Bidders
- B. Section 00 41 00 - Bid Form
- C. Section 01 11 00 - Summary Of Work

**PART 2 - PRODUCTS (NOT APPLICABLE)**

**PART 3 - EXECUTION**

**3.01 SPECIFIC:**

- A. Bid item is an amount proposed by bidder and stated on the Bid and Acceptance Form for certain Work defined in the Bidding Documents that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change in either the amount of Work to be completed, the Contract Documents, or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
  - 1. The amount added or deducted from the base bid is the net addition to or deducted from the base bid to incorporate bid item Work into the Work. Unless noted otherwise, no other adjustments are made to the Contract Amount, Milestones or the Contract Time.

**3.02 PROCEDURES:**

- A. Contractor shall modify or adjust affected adjacent Work as necessary to completely and fully integrate Owner accepted bid item Work.
  - 1. Include as part of each bid item, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not mentioned as part of the bid item.
- B. Accepted bid items are subject to the same terms and conditions as other Work of the Contract Documents.
- C. Owner reserves the right to accept bid items for a period of ninety (90) days after bid opening date.
- D. Schedule: A schedule of bid items is included at the end of this Section. The Contract Documents referenced in the schedule identify necessary requirements to complete the Work described as specified for each bid item.

**3.03 SCHEDULE OF ALTERNATES**

- A. **Add Alternate No. 01 – Carpet Replacement (Rooms 01, 02, 03, 13, and 23)**
  - 1. Scope:
    - a. Remove existing carpet and wall base in Rooms 01, 02, 03, 13, and 23. Provide new carpet (CPT-1) and 4-inch rubber base per Sheet A011.
  - 2. Work Included:
    - a. Selective demolition and removal of existing flooring and base. Hazardous materials abatement as required by the project HazMat report and abatement specifications.
    - b. Substrate preparation, including floor leveling and moisture barrier installation.
    - c. Installation of new CPT-1 carpet and 4-inch rubber base with all required adhesives, accessories, and transitions for a complete installation.

- d. Cleaning and protection of new finishes.
- e. Hazardous materials abatement as required by the project HazMat report and abatement specifications.
- f. Substrate preparation, including floor leveling and moisture barrier installation.
- g. Installation of new CPT-1 carpet and 4-inch rubber base with all required adhesives, accessories, and transitions for a complete installation.
- h. Cleaning and protection of new finishes.
- i. Substrate preparation, including floor leveling and moisture barrier installation.
- j. Installation of new CPT-1 carpet and 4-inch rubber base with all required adhesives, accessories, and transitions for a complete installation.
- k. Cleaning and protection of new finishes.
- 3. Base Bid Work:
  - a. Protect existing carpet flooring and base in place during construction.
- B. Add Alternate No. 02: Lobby and Vestibule Tile Replacement (Rooms 21 and 25)**
  - 1. Scope:
    - a. Remove existing tile flooring in Rooms 21 and 25 (Lobby and Vestibule) and replace with new Large Format Tile (LFT) per Sheet A011.
  - 2. Work Included:
    - a. Selective demolition and removal of existing flooring, including mud bed.
    - b. Hazardous materials abatement as required by the project HazMat report and abatement specifications. Substrate preparation, including floor leveling and moisture barrier installation.
    - c. Installation of new Large Format Tile (LFT) per TCNA standards, including setting materials, grout, and sealer.
    - d. Installation of edge trims, transitions, and patching of adjacent surfaces for a complete, finished installation.
    - e. Cleaning and protection of new finishes.
    - f. Substrate preparation, including floor leveling and moisture barrier installation.
    - g. Installation of new Large Format Tile (LFT) per TCNA standards, including setting materials, grout, and sealer.
    - h. Installation of edge trims, transitions, and patching of adjacent surfaces for a complete, finished installation.
    - i. Cleaning and protection of new finishes.
  - 3. Base Bid Work:
    - a. Protect existing tile flooring and base in place during construction. Patch and repair existing floor finishes as indicated on drawings.
- C. Add Alternate No. 03: FF&E Infrastructure**
  - 1. Scope:
    - a. Provide electrical power and data infrastructure as indicated on Sheet I220 to support future Furniture, Fixtures, and Equipment (FF&E).
  - 2. Work Included:
    - a. Furnish and install conduit, outlet boxes, wiring, and data cabling as shown or indicated in the specifications.
    - b. Coordinate power and data locations with architectural and furniture layouts.
    - c. Provide terminations, labeling, and testing for complete functional outlets.
    - d. Restore all surfaces affected by the work.
- D. General Requirements for All Alternates.**





**SECTION 01 23 00  
ALTERNATES**

**DIVISION 01**

1. Coordinate work with adjacent finishes and existing conditions.
2. Include all patching, cutting, and restoration necessary to complete alternate work.
3. Include required protection, temporary enclosures, and cleaning.
4. Comply with all applicable sections of Division 01 and referenced specification sections.
5. Price each alternate as a complete, fully functional system, including all labor, materials, equipment, and coordination necessary for completion.

**END OF SECTION**

**SECTION 01 25 13**

**PRODUCT PROCEDURES FOR SUBSTITUTION AND “OR EQUAL”**

**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. This Section includes administrative and procedural requirements for handling requests for substitutions and “or equal” submitted pursuant to the General Conditions.

**1.02 RELATED REQUIREMENTS**

- A. Section 00 21 13 - Instructions to Bidders: Restrictions on timing of substitution requests.
- B. Section 00 43 25 - Substitution Request Form - During Procurement: Required form for substitution requests made prior to award of contract (During procurement).
- C. Section 00 63 25 - Substitution Request Form - During Construction: Required form for substitution requests made after award of contract (During construction).
- D. Section 01 33 00: Submittal Procedures.
- E. Section 01 60 00: Product Requirements.
- F. Section 01 77 00: Contract Closeout.

**1.03 APPLICATION**

- A. OAR will review the Contractor's proposed changes in products or materials required by the Contract Documents.
  - 1. Substitutions: OAR will consider requests for substitution if a product is no longer manufactured or the OAR and Architect, after a diligent search, have verified that the product or material is not available to Contractor. The following are not considered to be valid requests for substitutions:
    - a. Revisions to the Contract Documents requested by OAR or Architect.
    - b. Specified options of products included in the Contract Documents.
    - c. Substitutions requested on a “or equal” or “equivalent” basis. This is determined by OAR’s approval and their opinion of a substituted product being the same or better to the product originally specified.
  - 2. “Or Equal”: OAR will consider requests for “or equal” if submitted within the time indicated in Section 002113 Instruction to Bidders, Paragraph 3.04, and Section 00 72 00 General Conditions, Paragraph 1.14.

**1.04 SUBMITTALS**

- A. Transmit submittals as described in related Sections for each request for substitution or “or equal”.
  - 1. Identify the product to be replaced in each request. Include the related Specification Section and Drawing number.
  - 2. Provide complete documentation denoting compliance with the requirements for substitutions, and the following information, as appropriate.
    - a. A detailed comparison of significant qualities of the proposed substitution with those specified in the Contract Documents. Significant qualities may include elements, such as performance, weight, size, durability, and visual effect.
    - b. Product Data, including Drawings, descriptions of products, fabrication, and installation procedures.
    - c. Samples, where applicable or requested.
    - d. Coordination information, including a list of changes or modifications made necessary to other parts of the Work, including the work of other trades that will become necessary to accommodate the proposed substitution.



**SECTION 01 25 13  
PRODUCT PROCEDURES  
FOR SUBSTITUTION AND  
"OR EQUAL"**

**DIVISION 01**

- e. Contractor certification that the proposed substitution or "or equal" conforms to the requirements of the Contract Documents in every respect and is appropriate for the applications indicated.
- f. Contractor waiver of rights to an increase in the Contract Amount, Milestones and/or Contract Time.
3. If required, OAR and Architect will request additional information or documentation for evaluation.
4. Architect will review requests for substitutions and "or equals" and provide a recommendation to OAR.
5. If Architect accepts proposed substitutions or "or equals" OAR will forward submittals to the Owner's Maintenance and Operations Technical Unit for review. OAR will notify Contractor of acceptance or rejection of the substitution.
6. Where a proposed substitution or "or equal" involves and/or affects more than one Subcontractor, Contractor shall ensure each Subcontractor cooperates with the other Subcontractor involved to coordinate the Work, provide uniformity and consistency, and assure compatibility of all products.
7. Contractor submittal and Architect review of Shop Drawings, Product Data, material lists or Samples do not constitute an acceptable or valid request for substitutions or "or equals".

**1.05 EVALUATION OF NON-CONFORMING WORK**

- A. If the OAR determines that installed work is non-conforming with the Contract Documents, the Contractor shall make necessary adjustments and mediation to bring the work into compliance, which may include removing and reinstalling the Work.
- B. At the Contractor's request and Owner's discretion, non-conforming work may be evaluated by the OAR to determine if it is acceptable to remain in place contingent upon the following:
  1. The Contractor shall submit all necessary documentation similar to a substitution request as noted in Section 01 25 13, Paragraph 1.04.
  2. In addition to items noted above, the Contractor shall submit a comparative schedule showing the duration of replacement and associated impacts.
  3. The Contractor shall prepare a deductive change order for the acceptance of the Work.
  4. The Owner shall reserve the right to recover Architectural and Engineering fees for the review of non-conforming work.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION**

**END OF SECTION**

**SECTION 01 29 00  
PAYMENT PROCEDURES**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Requirements:
  - 1. Document 01 29 73 "Schedule of Values" for requirements for furnishing a schedule of values.
  - 2. Section 01 21 00 "Allowances" for procedural requirements governing the handling and processing of allowances.
  - 3. Section 01 32 00 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

**1.02 DEFINITIONS**

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

**1.03 SCHEDULE OF VALUES**

- A. Applications for Payment shall be prepared in accordance with the Schedule of Values submitted under Section 01 29 73 - Schedule of Values. No revisions shall be made except as provided in Section 01 29 73 - Schedule of Values.

**1.04 APPLICATIONS FOR PAYMENT**

- A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments, as certified by Construction Manager and paid for by Owner.
- B. Payment Application Times: The date for each progress payment is indicated in the Owner/Contractor Agreement. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.
- C. Payment Application Times: Submit final Application for Payment to Construction Manager by the end of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.
  - 1. Submit draft copy of Application for Payment five (5) calendar days prior to due date for review by Construction Manager.
- D. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 or as approved by Owner as form for Applications for Payment.
  - 1. Other Application for Payment forms proposed by the Contractor may be acceptable to Construction Manager and Owner. Submit forms for approval with initial submittal of schedule of values.
- E. Application Preparation: Complete every entry on form. Execute by a person authorized to sign legal documents on behalf of Contractor. Construction Manager 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 and Construction Change Directives issued before last day of construction period covered by application.
  4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.
- F. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, 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 Owner, 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.
- G. Transmittal: Submit, through Electronic Project Management System, signed and notarized original copies of each Application for Payment to Construction Manager. One copy shall include waivers of lien and similar attachments if required.
1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- H. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment for the construction period covered by the previous application.
1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
  2. When an application shows completion of an item, submit conditional final or full waivers.
  3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
  4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
  5. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.
- 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. List of subcontractors.
  2. Schedule of values.
  3. Contractor's construction schedule (preliminary if not final).
  4. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
  5. Products list (preliminary if not final).
  6. Sustainable design action plans, including preliminary project materials cost data.
  7. Schedule of unit prices.



**SECTION 01 29 00  
PAYMENT PROCEDURES**

**DIVISION 01**

8. Submittal schedule (preliminary if not final).
9. List of Contractor's staff assignments.
10. List of Contractor's principal consultants.
11. Copies of building permits.
12. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
13. Initial progress report.
14. Report of preconstruction conference.
15. Certificates of insurance and insurance policies.
16. Performance and payment bonds.
17. Data needed to acquire Owner's insurance.
- J. Application for Payment at Substantial Completion: After the Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for the portion of the Work claimed as substantially complete.
  1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
    - a. Complete administrative actions, submittals, and Work preceding this application, as described in Section 017700 "Closeout Procedures."
  2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- K. 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.
  2. Certification of completion of final punch list items.
  3. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
  4. Updated final statement, accounting for final changes to the Contract Sum.
  5. AIA Document G706.
  6. AIA Document G706A.
  7. AIA Document G707.
  8. Evidence that claims have been settled.
  9. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
  10. Final liquidated damages settlement statement.
  11. Proof that taxes, fees, and similar obligations are paid.
  12. Waivers and releases.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

**END OF SECTION**

**SECTION 01 29 73  
SCHEDULE OF VALUES**

**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. Requirements for preparation, format, submission, and revision of a certified Schedule of Values for review and approval by the Owner's Authorized Representative (OAR).

**1.02 RELATED REQUIREMENTS**

- A. Section 01 21 00 - Allowances.
- B. Section 01 23 00 - Alternates.
- C. Section 01 29 00 - Payment Procedures.
- D. Section 01 31 00 - Project Management And Coordination.
- E. Section 013300: Submittal Procedures.

**1.03 SUBMITTALS**

- A. Contractor shall submit a certified copy of a Schedule of Values for review and approval by the OAR within fourteen (14) calendar days from the Notice to Proceed.
  - 1. OAR will review and, if necessary, return the submitted Schedule of Values with summary comments noting items not in compliance with the requirements of the Contract Documents. Contractor shall revise the submitted Schedule of Values and return within three (3) days of receipt of summary comments.
  - 2. Signature by OAR shall constitute acceptance of the submitted Schedule of Values.
  - 3. An approved copy of the Schedule of Values by OAR will be transmitted to Contractor, and Inspector.

**1.04 COORDINATION**

- A. Coordinate preparation of a Schedule of Values with the preparation of the Construction Schedule as set forth in 00 73 00 - Special Conditions.
- B. Coordinate line items in the Schedule of Values with activities in the construction schedule.
- C. Submit the Schedule of Values to the OAR no later than 14 days before the first Application for Payment and no later than 7 days before the initial scheduled submittal date for Applications for Payment.

**1.05 FORMAT AND CONTENT**

- A. Use the Project Manual table of contents as a guide; provide at least one line item for each Specification Section.
- B. Identification: Include the following on the Schedule of Values:
  - 1. Project name and location.
  - 2. Owner's name and project number.
  - 3. Architect's name and project number.
  - 4. Contract number.
  - 5. Contractor's name and address.
  - 6. Date of submittal.
- C. Arrange the Schedule of Values consistent with AIA Document G703 or approved equivalent.
- D. Provide a tabular form with separate columns for:
  - 1. Related Specification Section or Division.
  - 2. Description of Work.
  - 3. Subcontractor, manufacturer, fabricator, or supplier.
  - 4. Change Order numbers affecting value.



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5. Dollar value of labor, materials, and equipment, expressed as percentages of the Contract Sum to the nearest one-hundredth percent. Round amounts to whole dollars. The total shall equal the Contract Sum.
- E. Provide a breakdown of the Contract Sum in enough detail to facilitate review of Applications for Payment and progress reports. Provide multiple line items for principal subcontract amounts exceeding five (5) percent of the Contract Sum.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION**

**3.01 LINE ITEM REQUIREMENTS**

- A. Provide separate line items for:
  1. Subcontract amounts, where appropriate.
  2. Stored materials and equipment, differentiating between on-site and off-site storage.
  3. Materials, labor, and equipment.
  4. Each allowance, showing value as unit cost multiplied by measured quantity.
  5. Owner-furnished or direct purchase contracts.
  6. Temporary facilities and other major indirect costs not directly related to work-in-place.
  7. Project closeout requirements in amounts acceptable to the Owner.
  8. Change Orders and Construction Change Directives.
- B. Each line item shall include total cost and proportionate share of overhead and profit, except where shown separately.

**3.02 REVISIONS**

- A. Revise the Schedule of Values whenever Change Orders or Construction Change Directives alter the Contract Sum.
- B. Without changing the Contract Sum, the Owner may require redistribution of line-item values to conform to Owner's accounting practices.
- C. 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.
- D. Round amounts to the nearest whole dollar; the total shall equal the Contract Amount.
- E. Provide a breakdown of the Contract Amount in enough detail acceptable to OAR to facilitate continued evaluation of Application for Payment and progress reports.
- F. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item except the amounts shown as separate line items as indicated under the Schedule of Values form.
- G. An approved certified Schedule of Values shall serve as the basis for the monthly certified Application for Payment.
- H. If at any time, Owner determines, in its reasonable discretion, that the schedule of Values does not approximate the actual cost being incurred by Contractor to perform the Work, Contractor shall prepare, for OAR approval, a revised Schedule of Values, which then shall be used as the basis for future progress payments. Without changing the Contract Amount, Owner reserves the right to require Contractor:
  1. To increase or decrease amounts within the line items in the Schedule of Values; and,
  2. To conform the price breakdown to Owner accounting practice.

**END OF SECTION**



**SECTION 01 31 00**  
**PROJECT MANAGEMENT AND COORDINATION**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Section includes administrative provisions for coordinating construction operations on Project, including, but not limited to, the following:
  - 1. General coordination procedures.
  - 2. Coordination drawings.
  - 3. RFIs.
  - 4. Digital project management procedures.
  - 5. Web-based Project management software package.
  - 6. Project meetings.
    - a. Pre-installation conferences.
    - b. Preconstruction meeting.
    - c. Meetings as required by OAR.
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.
- C. Related Requirements:
  - 1. Section 01 32 00 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
  - 2. Section 01 77 00 "Closeout Procedures" for coordinating closeout of the Contract.

**1.02 DEFINITIONS**

- A. BIM: Building Information Modeling.
- B. RFI: Request for Clarification. Request from Contractor seeking information required by or clarifications of the Contract Documents.

**1.03 INFORMATIONAL SUBMITTALS**

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
  - 1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.
  - 2. Number and title of related Specification Section(s) covered by subcontract.
  - 3. Drawing number and detail references, as appropriate, covered by subcontract.
- B. Key Personnel Names: Within 15 calendar 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 addresses, cellular telephone numbers, and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
  - 1. Post copies of list in Project meeting room, in temporary field office, in web-based Project software directory. Always keep list current.

**1.04 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.



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1. Schedule construction operations in sequence required to obtain the best results, where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Coordination of Multiple Contracts: Each contractor shall cooperate with project coordinator, who shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its own operations with operations included in different Sections that depend on each other for proper installation, connection, and operation.
  1. Schedule construction operations in sequence required to obtain the best results, where installation of one part of the Work depends on installation of other components, before or after its own installation.
  2. Coordinate installation of different components with other contractors to ensure maximum performance and accessibility for required maintenance, service, and repair.
  3. Make adequate provisions to accommodate items scheduled for later installation.
- C. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
  1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- D. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and scheduled activities of other contractors with Construction Manager 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. Buy out of Subcontracts and Materials.
  5. Delivery and processing of submittals, including durations for review.
  6. Progress meetings.
  7. Preinstallation conferences.
  8. Project closeout activities.
  9. Startup and adjustment of systems.

**1.05 COORDINATION DRAWINGS**

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely indicated on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
  1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:



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- a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
  - b. Coordinate the addition of trade-specific information to coordination drawings in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
  - c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
  - d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
  - e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
  - f. Indicate required installation sequences.
  - g. Indicate dimensions shown on Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternative sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
- B. Coordination Drawing Organization: Organize coordination drawings as follows:
1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
  2. Plenum Space: Indicate subframing for support of ceiling, and wall systems, mechanical and electrical equipment, and related Work. Locate components within plenums to accommodate layout of light fixtures and other components indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
  3. Mechanical Rooms: Provide coordination drawings for mechanical rooms, showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
  4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
  5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
  6. Mechanical and Plumbing Work: Show the following:
    - a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
    - b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
    - c. Fire-rated enclosures around ductwork.
  7. Electrical Work: Show the following:
    - a. Runs of vertical and horizontal conduit 1-1/4 inches (32 mm) in diameter and larger.
    - b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.



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- c. Panel board, switchboard, switchgear, transformer, busway, generator, and motor-control center locations.
    - d. Location of pull boxes and junction boxes, dimensioned from column center lines.
  - 8. Fire-Protection System: Show the following:
    - a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.
  - 9. Review: Architect will review coordination drawings to confirm that, in general, the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make suitable modifications and resubmit.
  - 10. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 01 33 00 "Submittal Procedures."
- C. Coordination Drawing Process: Prepare coordination drawings in the following manner:
  - 1. Schedule submittal and review of Fire Sprinkler, Plumbing, HVAC, and Electrical Shop Drawings to make required changes prior to preparation of coordination drawings.
  - 2. Commence routing of coordination drawing files with HVAC Installer, who will provide drawing plan files denoting approved ductwork. HVAC Installer will locate ductwork and piping on a single layer, using orange color. Forward drawings to Plumbing Installer.
  - 3. Plumbing Installer will locate plumbing and equipment on a single layer, using blue color.
  - 4. Fire Sprinkler Installer will locate piping and equipment, using red color. Fire Sprinkler Installer shall forward drawing files to Electrical Installer.
  - 5. Electrical Installer will indicate service and feeder conduit runs and equipment in green color. Electrical Installer shall forward drawing files to Communications and Electronic Safety and Security Installer.
  - 6. Communications and Electronic Safety and Security Installer will indicate cable trays and cabling runs and equipment in purple color. Communications and Electronic Safety and Security Installer shall forward completed drawing files to Contractor.
  - 7. Contractor shall perform the final coordination review. As each coordination drawing is completed, Contractor will meet with Architect to review and resolve conflicts on the coordination drawings.
- D. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
  - 1. File Preparation Format:
    - a. Same digital data software program, version, and operating system as original Drawings.
    - b. DWG Latest Version, operating in Microsoft Windows operating system.
  - 2. File Submittal Format: Submit or post coordination drawing files using PDF format.
  - 3. BIM File Incorporation: Develop and incorporate coordination drawing files into BIM established for Project.
    - a. Perform three-dimensional component conflict analysis as part of preparation of coordination drawings. Resolve component conflicts prior to submittal. Indicate where conflict resolution requires modification of design requirements by Architect.
  - 4. Architect will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.
    - a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.



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- b. Contractor shall execute a data licensing agreement in the form acceptable to Owner and Architect.

**1.06 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 through the Project Management Control System.
  - 1. The architect will return without response those RFIs submitted to the Architect by other entities controlled by the Contractor.
  - 2. Coordinate and submit RFIs promptly to avoid delays in the Contractor's work or the work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of the item needing information or interpretation and the following:
  - 1. Project name.
  - 2. Owner name.
  - 3. Owner's Project number.
  - 4. Name of Architect and Construction Manager.
  - 5. Date.
  - 6. Name of Contractor.
  - 7. RFI number, numbered sequentially.
  - 8. RFI subject.
  - 9. Specification Section number and title and related paragraphs, as appropriate.
  - 10. Drawing number and detail references, as appropriate.
  - 11. Field dimensions and conditions, as appropriate.
  - 12. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state the impact in the RFI.
  - 13. Contractor's signature.
  - 14. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
    - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: As provided or approved by Owner. Alternate forms permitted only with prior written approval by Owner.
  - 1. Attachments shall be electronic files in PDF format.
- D. Architect's and Construction Manager's Action: Architect and Construction Manager will review each RFI, determine action required, and respond. Allow seven (7) calendar days for Architect's response for each RFI. RFIs received by Construction Manager after 1:00 p.m. will be considered as received the following working day.
  - 1. The following Contractor-generated RFIs will be returned without action:
    - a. Requests for approval of submittals.
    - b. Requests for approval of substitutions.
    - c. Requests for approval of Contractor's means and methods.
    - d. Requests for coordination information already indicated in the Contract Documents.
    - e. Requests for adjustments in the Contract Time or the Contract Sum.
    - f. Requests for interpretation of Architect's actions on submittals.
    - g. The requested clarification is ambiguous or unclear.



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- h. Incomplete RFIs or inaccurately prepared RFIs.
- 2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architect Construction Manager of additional information.
- 3. Architect response is a clarification of the intent of the Contract Documents and does not authorize changes in the Contract Amount, Milestones and/or Contract Time.
- 4. Architect'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 too the General Conditions."
  - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Construction Manager in writing within Three (3) Calendar days of receipt of the RFI response.
- 5. The Owner reserves the right to assess the Contractor for the cost (based on time and materials) of the review process performed by the Architect and/or any of the Architect's or Owner consultants when RFIs fail to conform to the requirements stated herein, or in the opinion of the Architect, are unnecessary or frivolous (i.e.; the subject of the inquiry noted in the RFI is suitably and/or clearly addressed in the Contract Documents).
- 6. The Contractor shall submit RFIs sufficiently in advance of the Work to be performed as it relates to the Construction Schedule such that the Architect has ample time to review and respond to RFIs. The Architect will respond to RFIs sequentially in the order they are received. The Architect shall receive the RFIs via email the same day they are written.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Use software log that is part of web-based Project management software. Include the following.
  - 1. Project name.
  - 2. Name and address of Contractor.
  - 3. Name and address of Architect and Construction Manager.
  - 4. RFI number, including RFIs that were returned without action or withdrawn.
  - 5. RFI description.
  - 6. Date the RFI was submitted.
  - 7. Date Architect's and Construction Manager's response was received.
  - 8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
  - 9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.
- F. On receipt of Construction Manager's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Construction Manager within three Calendar days if Contractor disagrees with response.
- G. Changes or alterations to the approved drawings or specifications shall be made by means of addenda or change orders as per section 4-338 of the California Building Standards Commission's, California Administrative Code.

**1.07 DIGITAL PROJECT MANAGEMENT PROCEDURES**

- A. Use of Architect's Digital Data Files: Digital data files of Architect's CAD drawings will be provided by Architect 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.



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2. Architect 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 licensing agreement in the form acceptable to Owner and Architect.
4. The following digital data files will be furnished for each appropriate discipline:
  - a. Floor plans.
  - b. Reflected ceiling plans.
  - c. Others as requested and approved by Owner.
- B. Owner-Provided Web-Based Project Management Software Package:
  1. Owner will provide and administer a web-based Project management software package for purposes of hosting and managing Project communication and documentation until Final Completion.
  2. Web-based Project management software includes, at a minimum, the following features:
    - a. Compilation of Project data, including Contractor, subcontractors, Architect, Architect's consultants, Owner, and other entities involved in Project. Include names of individuals and contact information.
    - b. Access control for each entity for each workflow process, to determine entity's digital rights to create, modify, view, and print documents.
    - c. Document workflow planning, allowing customization of workflow between project entities.
    - d. Creation, logging, tracking, and notification for Project communications required in other Specification Sections, including, but not limited to, RFIs, submittals, Minor Changes in the Work, Construction Change Directives, and Change Orders.
    - e. Track status of each Project communication in real time, and log time and date when responses are provided.
    - f. Procedures for handling PDFs or similar file formats, allowing markups by each entity. Provide security features to lock markups against changes once submitted.
    - g. Processing and tracking of payment applications.
    - h. Processing and tracking of contract modifications.
    - i. Creating and distributing meeting minutes.
    - j. Document management for Drawings, Specifications, and coordination drawings, including revision control.
    - k. Management of construction progress photographs.
    - l. Mobile device compatibility, including smartphones and tablets.
  3. Manufacturers: Subject to compliance with requirements, Owner-provided software may include, but is not limited to, the following vendors:
    - a. Procore Technologies, Inc.
    - b. Construction Management Enterprises (CMIS)
- C. PDF Document Preparation: Where PDFs are required to be submitted to Construction Manager, prepare as follows:
  1. Assemble a complete submittal package into a single indexed file, incorporating the submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
  2. Name file with submittal number or other unique identifier, including revision identifier.
  3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.





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**1.08 PROJECT MEETINGS**

- A. General: Construction Manager will schedule and conduct meetings and conferences at Project site unless otherwise indicated.
- B. Preconstruction Conference:
  - 1. Construction Manager will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner, but no later than fifteen (15) calendar days after execution of the Agreement.
  - 2. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Construction Manager, Architect, their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
    - a. Agenda: Discuss items of significance that could affect progress, including the following:
      - 1) Responsibilities and personnel assignments.
      - 2) Tentative construction schedule.
      - 3) Phasing.
      - 4) Critical work sequencing and long lead items.
      - 5) Designation of key personnel and their duties.
      - 6) Lines of communications.
      - 7) Use of web-based Project software.
      - 8) Procedures for processing field decisions and Change Orders.
      - 9) Procedures for RFIs.
      - 10) Procedures for testing and inspecting.
      - 11) Procedures for processing Applications for Payment.
      - 12) Distribution of the Contract Documents.
      - 13) Submittal procedures.
      - 14) Sustainable design requirements.
      - 15) Preparation of Record Documents.
      - 16) Use of the premises.
      - 17) Work restrictions.
      - 18) Working hours.
      - 19) Owner's occupancy requirements.
      - 20) Responsibility for temporary facilities and controls.
      - 21) Procedures for moisture and mold control.
      - 22) Procedures for disruptions and shutdowns.
      - 23) Construction waste management and recycling.
      - 24) Parking availability.
      - 25) Office, work, and storage areas.
      - 26) Equipment deliveries and priorities.
      - 27) First aid.
      - 28) Security.
      - 29) Progress cleaning.
    - b. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.





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**1.09 PREINSTALLATION CONFERENCES**

- A. 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:
    - a. 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 Architect, Construction Manager, Inspectors, and Owner's Commissioning Authority] 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. Sustainable design requirements.
    - i. Review of mockups.
    - j. Possible conflicts.
    - k. Compatibility requirements.
    - l. Time schedules.
    - m. Weather limitations.
    - n. Manufacturer's written instructions.
    - o. Warranty requirements.
    - p. Compatibility of materials.
    - q. Acceptability of substrates.
    - r. Temporary facilities and controls.
    - s. Space and access limitations.
    - t. Regulations of authorities having jurisdiction.
    - u. Testing and inspecting requirements.
    - v. Installation procedures.
    - w. Coordination with other work.
    - x. Required performance results.
    - y. Protection of adjacent work.
    - z. Protection of construction and personnel.
  - 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
  - 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
  - 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.



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**1.10 PROGRESS MEETINGS**

- A. Progress meetings will be held at the Project site at regular intervals, typically weekly, as determined by the OAR.
- B. In addition to representatives of Contractor, Owner, and Architect, each Subcontractor, supplier, or other entity concerned with current progress or involved in planning, coordination, or performance of the Work shall, if requested by OAR, be represented at these meetings. All participants at the conference shall be familiar with the Project and authorized to conclude all matters relating to the Work.
- C. Failure of Contractor to be so represented at any progress meeting which is held at a mutually agreed time or for which a written notice is given, shall not relieve Contractor from abiding by any and all OAR determinations or directives issued at such meeting.
- D. OAR will review and correct or approve minutes of the previous progress meeting and will review other significant items affecting progress. Topics for discussion as appropriate to the status of the Project include but are not limited to:
  - 1. Interface requirements.
  - 2. Construction Schedule.
    - a. Sequence and coordination.
  - 3. Status of submittals / RFCs.
  - 4. Deliveries.
  - 5. Off-site fabrication.Access.
  - 6. Site utilization.
  - 7. Temporary Construction Facilities and Controls.
  - 8. Hours of work.
  - 9. Hazards and risks.
  - 10. Housekeeping.
  - 11. Quality of materials, fabrication, and execution.
  - 12. Unforeseen conditions.
  - 13. Testing and Inspection.
  - 14. Defective Work.
  - 15. Construction Directive.
  - 16. Request for Proposal.
  - 17. Change Order Proposals and Change Orders.
  - 18. Documentation of information for payment requests.
  - 19. Application for Payment.
  - 20. Other items as required or as brought forth.
  - 21. Initial Notice of Start of Issue, Event, Condition, Circumstance, or Cause of Perceived Delay, Disruption, Interference, Hindrance, or Acceleration. (Article 12.2.1 of the General Conditions).
  - 22. Final Notice of End of Issue, Event, Condition, Circumstance, or Cause of Perceived Delay, Disruption, Interference, Hindrance, Acceleration (Article 12.2.2 of the General Conditions).
  - 23. Storm Water Pollution Prevention.
  - 24. CEQA Compliance.



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- E. No later than three (3) calendar days after each progress meeting, OAR will prepare and distribute minutes of the meeting to each present and absent party. Include a brief summary, in narrative form, of progress, decisions, directives, actions taken, and all other issues since the previous meeting and report.
- F. Schedule Updating: Contractor shall revise the Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized, and issue the revised schedule at the next scheduled progress meeting.

**1.11 ADDITIONAL MEETINGS**

- A. OAR, upon giving notice to the intended parties and without further obligation, may require additional meetings to discuss Work and/or Project-related activities.

**1.12 PROJECT CLOSEOUT CONFERENCE:**

- A. Construction Manager will schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 60 calendar days prior to the scheduled date of Substantial Completion.
- B. Conduct the conference to review requirements and responsibilities related to Project closeout.
  - 1. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Construction Manager, Inspectors, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; 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.
  - 2. 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 Substantial Completion and for final inspection for acceptance.
    - c. Procedures for completing and archiving web-based Project software site data files.
    - d. Submittal of written warranties.
    - e. Requirements for completing sustainable design documentation.
    - f. Requirements for preparing operations and maintenance data.
    - 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 Substantial Completion and for final payment.
    - k. Submittal procedures.
    - l. Coordination of separate contracts.
    - m. Owner's partial occupancy requirements.
    - n. Installation of Owner's furniture, fixtures, and equipment.
    - o. Responsibility for removing temporary facilities and controls.
  - 3. Minutes: Entity conducting meeting will record and distribute meeting minutes.
- C. Progress Meetings: Construction Manager will conduct progress meetings at regular intervals.
  - 1. Coordinate dates of meetings with preparation of payment requests.



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2. Attendees: In addition to representatives of Owner, Owner's Commissioning Authority, Construction Manager, Inspectors, and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
  - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
    - 1) Review schedule for next period.
  - b. Review present and future needs of each entity in attendance, including the following:
    - 1) Interface requirements.
    - 2) Sequence of operations.
    - 3) Resolution of BIM component conflicts.
    - 4) Status of submittals.
    - 5) Status of sustainable design documentation.
    - 6) Deliveries.
    - 7) Off-site fabrication.
    - 8) Access.
    - 9) Site use.
    - 10) Temporary facilities and controls.
    - 11) Progress cleaning.
    - 12) Quality and work standards.
    - 13) Status of correction of deficient items.
    - 14) Field observations.
    - 15) Status of RFIs.
    - 16) Status of Proposal Requests.
    - 17) Pending changes.
    - 18) Status of Change Orders.
    - 19) Pending claims and disputes.
    - 20) Documentation of information for payment requests.
4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
  - a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

**1.13 COORDINATION MEETINGS:**

- A. Construction Manager will conduct regular intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.



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1. Attendees: In addition to representatives of Owner, Owner's Commissioning Authority, Construction Manager, Inspectors, and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work.
  2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    - a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
    - b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
    - c. Review present and future needs of each contractor present, including the following:
      - 1) Interface requirements.
      - 2) Sequence of operations.
      - 3) Resolution of BIM component conflicts.
      - 4) Status of submittals.
      - 5) Deliveries.
      - 6) Off-site fabrication.
      - 7) Access.
      - 8) Site use.
      - 9) Temporary facilities and controls.
      - 10) Work hours.
      - 11) Hazards and risks.
      - 12) Progress cleaning.
      - 13) Quality and work standards.
      - 14) Status of RFIs.
      - 15) Proposal Requests.
      - 16) Change Orders.
      - 17) Pending changes.
  3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.
- B. The Contractor shall provide the Architect and Construction Manager with a minimum of three (3) days' notice for non-regularly scheduled meetings. The Architect reserves the right to assess for time and expenses of same-day meetings for foreseeable items.

**1.14 OWNER'S RIGHT TO RECORD**

- A. Contractor agrees, on behalf of itself and all its subcontractors, that the Owner may audiotape or videotape any meetings, training, and work at any time during the Project.



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**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

**END OF SECTION**

**SECTION 01 32 00**  
**CONSTRUCTION PROGRESS DOCUMENTATION**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following
  1. Preliminary (Start-Up) Construction Schedule
  2. Contractor's Construction (Baseline) Schedule
  3. Daily construction reports
  4. Monthly Updates and progress payments
  5. Three-week look-ahead Schedules
  6. As-Builts
  7. Material Location Report
  8. Site Condition Reports
  9. Unusual Events Reports
- B. Related Sections include the following:
  1. Section 00 72 00 - General Conditions
  2. Section 00 73 00 - Special Conditions
  3. Section 01 20 00 - Price and Payment Procedures
  4. Section 01 33 00 - Submittal Procedures for submitting schedules and reports.
  5. Section 01 40 00 Quality Requirements - Procedures for submitting a schedule of tests and inspections.
  6. Section 01 77 00 – Contract Closeout

**1.02 SECTION INCLUDES**

- A. Scheduling of Work under this Contract shall be performed by Contractor in accordance with requirements of this Section.
  1. Development of schedule, monthly payment requests, and project status reporting requirements of the Contract shall employ computerized Critical Path Method (“CPM”) scheduling (“CPM Schedule”).
  2. CPM Schedule shall portray all significant activities of the project including design activities, jurisdictional approvals, each trade or operation and major materials, submittals of shop drawings, equipment data, procurement of materials, civic art installation, if necessary, required approvals by the City as well as other permitting agencies such as Goleta Water District, inspections and testing, commissioning, and project start-up.
  3. Submit schedules and reports as specified in the General Conditions.
- B. Upon Award of Contract, Contractor shall immediately commence development of Initial and Original CPM Schedules to ensure compliance with CPM Schedule submittal requirements.

**1.03 QUALIFICATIONS**

- A. Contractor shall employ experienced scheduling personnel qualified to use the latest version of Oracle Primavera P6 Project Planner. Experience level required is set forth below. Contractor may employ such personnel directly or may employ a consultant for this purpose.
  1. The written statement shall identify the individual who will perform CPM scheduling.
  2. Capability and experience shall be verified by description of construction projects on which individual has successfully applied computerized CPM.



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3. Required level of experience shall include at least two (2) projects of similar nature and scope with value not less than three fourths ( $\frac{3}{4}$ ) of the Total Bid Price of this Project. The written statement shall provide contact persons for referenced projects with current telephone and address information.
- B. City reserves the right to approve or reject Contractor's scheduler or consultant at any time. City reserves the right to refuse replacing of Contractor's scheduler or consultant if City believes replacement will negatively affect the scheduling of Work under this Contract.
- C. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to the preliminary construction schedule and 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 work stages, interim milestones, and Owner occupancy.
  4. Review delivery dates for Owner-furnished products.
  5. Review schedule for work of Owner's separate contracts.
  6. Review submittal requirements and procedures.
  7. Review time required for review of submittals and resubmittals.
  8. Review requirements for tests and inspections by Project Inspector and independent testing and inspecting agencies.
  9. Review time required for Project closeout and Owner startup procedures, including commissioning activities.
  10. Review and finalize list of construction activities to be included in schedule.
  11. Review procedures for updating schedule.

**1.04 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. As-Built: A common term for Project Record Drawings.
- C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.
- D. Critical Path: The longest continuous chain of activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- E. Day: Calendar day unless noted otherwise.
- F. Event: The starting or ending point of an activity.
- G. Float: The measure of leeway in starting and completing an activity.
  1. Float time is not for the exclusive use or benefit of either the Owner or Contractor, but is jointly owned. Project resources available to both parties as needed to meet project 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 following activity.





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- 3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
- H. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.
- I. Major Area: A story of construction, a separate building, or a similar significant construction element.
- J. Milestone: A key or critical point in time for reference or measurement.
- K. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.
- L. Resource Loading: The allocation of labor and equipment necessary for completing an activity as scheduled.

**1.05 GENERAL**

- A. Progress Schedule shall be based on and incorporate milestone and completion dates specified in Contract Documents. Milestones shall include, at a minimum, the items shown in the table included at the end of this section.
- B. Overall time of completion and time of completion for each Milestone shown on Progress Schedule shall adhere to times in the Contract, unless an earlier (advanced) time of completion is requested by Contractor and agreed to by City. Any such agreement shall be formalized by a Change Order.
  - 1. City is not required to accept an early completion schedule, i.e., one that shows an earlier completion date than the Contract Time.
  - 2. Contractor shall not be entitled to extra compensation in event agreement is reached on an earlier completion schedule and Contractor completes its Work, for whatever reason, beyond completion date shown in its early completion schedule but within the Contract Time.
  - 3. A schedule showing the work completed in less than the Contract Time, and that has been accepted by City, shall be considered to have Project Float. The Project Float is the time between the scheduled completion of the work and the Completion Date. Project Float is a resource available to both City and the Contractor.
- C. Ownership Project Float: Neither the City nor Contractor owns Project Float. The Project owns the Project Float. As such, liability for delay of the Completion Date rests with the party whose actions, last in time, actually cause delay to the Completion Date.
  - 1. For example, if Party A uses some, but not all of the Project Float and Party B later uses remainder of the Project Float as well as additional time beyond the Project Float, Party B shall be liable for the time that represents a delay to the Completion Date.
  - 2. Party A would not be responsible for the time since it did not consume the entire Project Float and additional Project Float remained; therefore, the Completion Date was unaffected by Party A.
- D. Progress Schedule shall be the basis for evaluating job progress, payment requests, and time extension requests. Responsibility for developing Contract CPM Schedule and monitoring actual progress as compared to Progress Schedule rests with Contractor.



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- E. Failure of Progress Schedule to include any element of the Work, or any inaccuracy in Progress Schedule, will not relieve Contractor from responsibility for accomplishing the Work in accordance with the Contract. City's acceptance of schedule shall be for its use in monitoring and evaluating job progress, payment requests, and time extension requests and shall not, in any manner, impose a duty of care upon City, or act to relieve Contractor of its responsibility for means and methods of construction.
- F. Software: Use P6 (Primavera) or City-approved equal. Such software shall be compatible with Windows operating system. Contractor shall transmit contract file to City on compact disk at times requested by City.
- G. Transmit each item under the form approved by City.
  - 1. Identify Project with City Contract number and name of Contractor.
  - 2. Provide space for Contractor's approval stamp and City's review stamps.
  - 3. Submittals received from sources other than Contractor will be returned to the Contractor without City's review.

**1.06 INITIAL CPM SCHEDULE**

- A. Initial CPM Schedule submitted for review at the pre-construction conference shall serve as Contractor's schedule for up to ninety (90) calendar days after the Notice to Proceed.
- B. Indicate detailed plan for the Work to be completed in first ninety (90) days of the Contract; details of planned mobilization of plant and equipment; sequence of early operations; procurement of materials and equipment. Show Work beyond ninety (90) calendar days in summary form.
- C. Initial CPM Schedule shall be time scaled.
- D. Progress Payment Applications shall be returned to the Contractor without action taken by the City in the event the Contractor does not comply with this Specification Section. Submittal and acceptance of the Initial CPM Schedule in compliance with all Contract Document requirements shall be a condition precedent to the first progress payment. Use of Initial CPM Schedule for progress payments shall not exceed ninety (90) calendar days.
- E. City and Contractor shall meet to review and discuss the Initial CPM Schedule within seven (7) calendar days after it has been submitted to City.
  - 1. City's review and comment on the schedule shall be limited to Contract conformance (with sequencing, coordination, and milestone requirements).
  - 2. Contractor shall make corrections to schedule necessary to comply with Contract requirements and shall adjust schedule to incorporate any missing information requested by City. Contractor shall resubmit Initial CPM Schedule if requested by City.
- F. If, during the first ninety (90) days after Notice to Proceed, the Contractor is of the opinion that any of the Work included on its Initial CPM Schedule has been impacted, the Contractor shall submit to City a written Time Impact Evaluation ("TIA") in accordance with Article 1.12 of this Section. The TIA shall be based on the most current update of the Initial CPM Schedule.

**1.07 ORIGINAL CPM SCHEDULE**

- A. Submit a detailed proposed Original CPM Schedule presenting an orderly and realistic plan for completion of the Work in conformance with requirements as specified herein.
- B. Constraints: Include only constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
  - 1. Phasing: Arrange list of activities in the schedule by phase.
  - 2. Work by City: Include a separate activity for each portion of the Work performed by City.



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3. Owner Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 011000. Delivery dates indicated stipulate the earliest possible delivery date.
  4. Products Ordered in Advance: Include a separate activity for each product, include earliest possible delivery date.
  5. Work Restrictions: Show the effect of the following items on the schedule:
    - a. Coordination with existing construction.
    - b. Use of premises restrictions.
    - c. Seasonal Variations.
    - d. Environmental Control.
  6. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
    - a. Subcontract awards.
    - b. Temporary facilities
    - c. Submittals
    - d. Purchases
    - e. Mockups
    - f. Fabrication
    - g. Sample testing
    - h. Deliveries
    - i. Installation
    - j. Tests and inspections
    - k. Adjusting
    - l. Curing
    - m. Punch List
    - n. Startup and placement into final use and operation
    - o. Commissioning
  7. Area Separations: Identify each floor and major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities.
    - a. Structural Completion.
    - b. Temporary enclosure and space conditioning.
    - c. Permanent space enclosure
    - d. Completion of mechanical installation.
    - e. Completion of electrical installation.
    - f. Substantial Completion.
- C. Milestones: Include milestones indicated in the Contract Documents within the schedule, including, but not limited to, the Notice to Proceed, interim milestones indicated below, Substantial Completion, and Final Completion. Milestones shall be on a seven (7) day per week calendar.
1. Interim Milestones should include:
    - a. Foundation Completion.
    - b. Structural Completion.
    - c. Temporary enclosure and space conditioning.
    - d. Permanent space enclosure.
    - e. Building weather tight.



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- f. Completion of mechanical installation.
  - g. Completion of electrical installation.
  - h. Substantial Completion.
- D. Progress Schedule shall include or comply with following requirements:
  - 1. No activity on schedule shall have duration longer than fifteen (15) workdays, with exception of submittal, approval, fabrication, and procurement activities, unless otherwise approved by City.
    - a. Activity durations shall be total number of actual workdays required to perform that activity.
  - 2. Each activity in the schedule shall include the following information: Activity Designation/Number – (Description Label or Name), Duration, Calendar ID, Early start date, Late start date, Early finish date, Late finish time, Identification of activities which comprise the critical path for completion, and Total float; and milestone completion dates, if any.
  - 3. City furnished materials and equipment, if any, identified as separate activities.
  - 4. Activities for maintaining Project Record Documents.
  - 5. Dependencies (or relationships) between activities.
  - 6. Processing/approval of submittals and shop drawings for all material and equipment required per the Contract. Activities that are dependent on submittal acceptance or material delivery shall not be scheduled to start earlier than expected acceptance or delivery dates.
    - a. Include time for submittals, re-submittals, and reviews by City. Coordinate with accepted schedule for submission of Shop Drawings, samples, and other submittals.
    - b. Contractor shall be responsible for all impacts resulting from re-submittal of Shop Drawings and submittals.
  - 7. Procurement of major equipment, through receipt and inspection at jobsite, identified as separate activity.
    - a. Include time for fabrication and delivery of manufactured products for the Work.
    - b. Show dependencies between procurement and construction.
  - 8. Activity description; what Work is to be accomplished and where.
  - 9. Responsibility code for each activity corresponding to Contractor or Subcontractor responsible for performing the Work.
  - 10. Identify the activities which constitute the controlling operations or critical path. No more than twenty-five (25%) of the activities shall be critical or near critical. Near critical is defined as float in the range of one (1) to (10) days.
  - 11. Thirty (30) calendar days for developing punch list(s), completion of punch-list items, and final cleanup for the Work or any designated portion thereof. No other activities shall be scheduled during this period.
  - 12. Interface with the work of other contractors, City, and agencies such as, but not limited to, utility companies.
  - 13. Show detailed Subcontractor Work activities. In addition, and upon City request, furnish copies of Subcontractor schedules upon which CPM was built.
    - a. Also furnish for each Subcontractor, as determined by City, submitted on Subcontractor letterhead, a statement certifying that Subcontractor concurs with Contractor's Original CPM Schedule and that Subcontractor's related schedules have been incorporated, including activity durations and key milestones.



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- b. Subcontractor schedules shall be independently derived and not a copy of Contractor's schedule.
  - c. In addition to Contractor's schedule and resource loading, obtain from electrical, mechanical, and plumbing Subcontractors, and other Subcontractors as required by City, productivity calculations common to their trades, such as units per person day, feet of pipe per day per person, feet of wiring per day per person, and similar information.
  - d. Furnish schedule for Contractor/Subcontractor CPM schedule meetings which shall be held prior to submission of Original CPM schedule to City. City shall be permitted to attend scheduled meetings as an observer.
14. Activity durations shall be in Workdays.
15. Submit with the schedule a list of anticipated non-Workdays, such as weekends and holidays. The Progress Schedule shall exclude in its Workday calendar all non-Workdays on which Contractor anticipates critical Work will not be performed.
- E. Inclement Weather
- 1. Seasonal weather conditions shall be considered and included in the planning and scheduling of work influenced by high or low ambient temperatures and/or precipitation to ensure completion of all Work within the Contract Time. Seasonal weather conditions shall be determined by an assessment of average historical climate conditions based upon the preceding ten (10) year records published for the locality by the National Ocean and Atmospheric Administration (NOAA) and entitled, "Local Climatological Data – Santa Barbara Municipal Airport (SBA), Goleta, California."
  - 2. Inclement Weather Allowance: The agreement between the City and Contractor includes one (1) weather day per month (12 maximum per year) applicable only to Work performed outdoors. No allowance is provided for interior Work. Time extensions will be considered only if actual inclement weather conditions exceed this allowance, and only for exterior Work impacted. Within the stipulated Contract Time, included in the bid documents, includes weather days in the project duration.
  - 3. Contractor shall include the number of excusable days as the last activity prior to a Notice of Completion milestone in each Contract Schedule Update. As the number of approved inclement weather days increases, the duration of this allowance or activity will decrease the corresponding number of days. No other activities may be concurrent with this activity.
  - 4. Delays and Time Extension Due to Inclement Weather: Delays in the construction due to inclement weather will be construed as excusable delay only for the days in which the inclement weather substantially caused delay in overall progress of the Project by affecting Critical Work Activities.
  - 5. Contractor shall submit a written claim for each delay due to inclement weather within five (5) calendar days from the day of inclement weather. Contractor shall document the date and the nature of the inclement weather, the specific trade(s) in which the inclement weather caused delay, and the task or operation in each trade that was delayed and its relation to the Critical Path.
  - 6. The City's Representative will review the claim and the written documentation submitted by the Contractor and compare with the Contract Schedule. If the City's Representative finds that the inclement weather did substantially cause delay in the overall progress of the Project, the delay will be deemed an excusable delay.



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7. Excusable delays shall be first deducted from the allowance of excusable delays shown on the Contract Schedule. When the total number of days for excusable delays due to inclement weather exceeds the allowance, the excess will be granted through extension of the Contract Time by Change Order in accordance with the provisions of the General Conditions. Extension to the Contract Time due to inclement weather will be granted only for excusable delay in excess of the allowance.
8. If the Contractor fails to submit a claim and documentation within the stipulated time, the inclement weather shall be construed to have caused no delay in the construction.
- F. Original CPM Schedule Review Meeting: Contractor shall, within sixty (60) days from the Notice to Proceed date, meet with City to review the Original CPM Schedule submittal.
  1. Contractor shall have its Project Manager, Project Superintendent, Project Scheduler, and key Subcontractor representatives, as required by City, in attendance. The meeting will take place over a continuous one (1) day period.
  2. City's review will be limited to submittal's conformance to Contract requirements including, but not limited to, coordination requirements. However, review may also include:
    - a. Clarifications of Contract Requirements.
    - b. Directions to include activities and information missing from submittal.
    - c. Requests to Contractor to clarify its schedule.
  3. Within five (5) days of the Schedule Review Meeting, Contractor shall respond in writing to all questions and comments expressed by City at the Meeting.

**1.08 ADJUSTMENTS TO CPM SCHEDULE**

- A. Adjustments to Original CPM Schedule: Contractor shall have adjusted the Original CPM Schedule submittal to address all review comments from original CPM Schedule review meeting and resubmit network diagrams and reports for City's review.
  1. City, within ten (10) days from date that Contractor submitted the revised schedule, will either:
    - a. Accept schedule activities as submitted, or
    - b. Advise Contractor in writing to review any part or parts of schedule which either do not meet Contract requirements or are unsatisfactory for City to monitor Project's progress, resources, and status or evaluate monthly payment request by Contractor.
  2. City may accept schedule with conditions that the first monthly CPM Schedule update be revised to correct deficiencies identified.
  3. When schedule is accepted, it shall be considered the "Original CPM Schedule" which will then be immediately updated to reflect the current status of the work.
  4. City reserves right to require Contractor to adjust, add to, or clarify any portion of schedule which may later be discovered to be insufficient for monitoring of Work or approval of partial payment requests. No additional compensation will be provided for such adjustments, additions, or clarifications.
- B. Acceptance of Contractor's schedule by City will be based solely upon schedule's compliance with Contract requirements.
  1. By way of Contractor assigning activity durations and proposing sequence of Work, Contractor agrees to utilize sufficient and necessary management and other resources to perform work in accordance with the schedule.
  2. Upon submittal of schedule update, updated schedule shall be considered "current" CPM Schedule.





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3. Submission of Contractor's schedule to City shall not relieve Contractor of total responsibility for scheduling, sequencing, and pursuing Work to comply with requirements of Contract Documents, including adverse effects such as delays resulting from ill-timed Work.
- C. Submittal of Original CPM Schedule, and subsequent schedule updates, shall be understood to be Contractor's representation that the Schedule meets requirements of Contract Documents, and that Work shall be executed in sequence indicated on the schedule.
- D. Contractor shall distribute Original CPM Schedule to Subcontractors for review and written acceptance, which shall be noted on Subcontractors' letterheads to Contractor and transmitted to City for the record.

**1.09 MONTHLY CPM SCHEDULE UPDATE SUBMITTALS**

- A. Following acceptance of Contractor's Original CPM Schedule, Contractor shall monitor progress of Work and adjust schedule each month to reflect actual progress and any anticipated changes to planned activities.
  1. Each schedule update submitted shall be complete, including all information requested for the Original CPM Schedule submittal.
  2. Each update shall continue to show all Work activities including those already completed. These completed activities shall accurately reflect "as built" information by indicating when activities were actually started and completed.
- B. A meeting will be held on approximately the twenty-fifth (25th) of each month to review the schedule update submittal and progress payment application.
  1. At this meeting, at a minimum, the following items will be reviewed: Percent (%) complete of each activity; Time Impact Evaluations for Change Orders and Time Extension Request; actual and anticipated activity sequence changes; actual and anticipated duration changes; actual and anticipated Contractor delays, and other pending modifications affecting the Work and Contract Time.
  2. These meetings are considered a critical component of overall monthly schedule update submittal and Contractor shall have appropriate personnel attend. At a minimum, these meetings shall be attended by Contractor's General Superintendent and Scheduler.
  3. Contractor shall plan on the meeting taking no less than four (4) hours.
- C. Within five (5) working days after monthly schedule update meeting, Contractor shall submit the updated CPM Schedule update.
- D. Within five (5) workdays of receipt of above noted revised submittals, City will either accept or reject monthly schedule update submittal.
  1. If accepted, percent (%) complete shown in monthly update will be basis for Application for Payment by the Contractor. The schedule update shall be submitted as part of the Contractor's Application for Payment.
  2. If rejected, update shall be corrected and resubmitted by Contractor before the Application for Payment is submitted.
- E. Neither updating, changing, or revising of any report, curve, schedule, or narrative submitted to City by Contractor under this Contract, nor City's review or acceptance of any such report, curve, schedule, or narrative shall have the effect of amending or modifying in any way the Completion Date or milestone dates or of modifying or limiting in any way Contractor's obligations under this Contract.



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**1.10 SCHEDULE REVISIONS**

- A. Updating the Schedule to reflect actual progress shall not be considered revisions to the Schedule. Since scheduling is a dynamic process, revisions to activity durations and sequences are expected on a monthly basis.
- B. To reflect revisions to the Schedule, the Contractor shall provide City with a written narrative with a full description and reasons for each Work activity revised. For revisions affecting the sequence of work, the Contractor shall provide a schedule diagram which compares the original sequence to the revised sequence of work. The Contractor shall provide the written narrative and schedule diagram for revisions two (2) working days in advance of the monthly schedule update meeting.
- C. Schedule revisions shall not be incorporated into any schedule update until the revisions have been reviewed by City. City may request further information and justification for schedule revisions and Contractor shall, within three (3) days, provide City with a complete written narrative response to City's request.
- D. If the Contractor's revision is still not accepted by City, and the Contractor disagrees with City's position, the Contractor has seven (7) calendar days from receipt of City's letter rejecting the revision to provide a written narrative providing full justification and explanation for the revision. The Contractor's failure to respond in writing within seven (7) calendar days of City's written rejection of a schedule revision shall be contractually interpreted as acceptance of City's position, and the Contractor waives its rights to subsequently dispute or file a claim regarding City's position.
- E. At City's discretion, the Contractor can be required to provide Subcontractor certifications of performance regarding proposed schedule revisions affecting said Subcontractors.

**1.11 RECOVERY SCHEDULE**

- A. If the Schedule Update shows a completion date twenty-one (21) calendar days beyond the Contract Completion Date, or individual milestone completion dates, the Contractor shall submit to City the proposed revisions to recover the lost time within seven (7) calendar days. As part of this submittal, the Contractor shall provide a written narrative for each revision made to recapture the lost time. If the revisions include sequence changes, the Contractor shall provide a schedule diagram comparing the original sequence to the revised sequence of work.
- B. The Recovery Schedule shall include all revised work schedules and labor projections required to recover the delay. If it is required to work weekends the Contractor shall inform the City and request support from the City/PMO. The Contractor will be required to pay for all costs associated with the recovery work.
- C. The revisions shall not be incorporated into any schedule update until the revisions have been reviewed by City.
- D. If the Contractor's revisions are not accepted by City, City and the Contractor shall follow the procedures in paragraph 1.09.C, 1.09.D and 1.09.E above.
- E. At City's discretion, the Contractor can be required to provide Subcontractor certifications for revisions affecting said Subcontractors.
- F. Under no circumstances will the addition of equipment or construction forces, increasing the working hours or any other method, manner, or procedure to return to the contractually required completion date be considered justification for a Contract Amendment or be treated as acceleration where the need for a recovery schedule has been caused by the Contractor and/or its Subcontractors, including its Suppliers/Vendors, at any tier.





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**1.12 TIME IMPACT ANALYSIS ("TIA") FOR CHANGE ORDERS, AND OTHER DELAYS**

- A. When Contractor is directed to proceed with changed Work, the Contractor shall prepare and submit within fourteen (14) calendar days from the Notice to Proceed a TIA which includes both a written narrative and a schedule diagram depicting how the changed Work affects other schedule activities. The schedule diagram shall show how the Contractor proposes to incorporate the changed Work in the schedule and how it impacts the current schedule-update critical path. The Contractor is also responsible for requesting time extensions based on the TIA's impact on the critical path. The diagram must be tied to the main sequence of schedule activities to enable City to evaluate the impact of changed Work to the scheduled critical path.
- B. Contractor shall be required to comply with the requirements of Paragraph 1.09.A for all types of delays such as, but not limited to, Contractor/Subcontractor delays, adverse weather delays, strikes, procurement delays, fabrication delays, etc.
- C. Contractor shall be responsible for all costs associated with the preparation of TIAs, and the process of incorporating them into the current schedule update. The Contractor shall provide City with one hard copy in addition to the electronic submittal of each TIA.
- D. Once agreement has been reached on a TIA, the Contract Time will be adjusted accordingly. If agreement is not reached on a TIA, the Contract Time may be extended in an amount City allows, and the Contractor may submit a claim for additional time claimed by contractor.

**1.13 TIME EXTENSIONS**

- A. The Contractor is responsible for requesting time extensions for time impacts that, in the opinion of the Contractor, impact the critical path of the current schedule update. Notice of time impacts shall be given in accordance with the General Conditions.
- B. Where an event for which City is responsible impacts the projected Completion Date, the Contractor shall provide a written mitigation plan, including a schedule diagram, which explains how (e.g., increase crew size, overtime, etc.) the impact can be mitigated. The Contractor shall also include a detailed cost breakdown of the labor, equipment, and material the Contractor would expend to mitigate City-caused time impact. The Contractor shall submit its mitigation plan to City within fourteen (14) calendar days from the date of discovery of the impact. The Contractor is responsible for the cost to prepare the mitigation plan.
- C. Failure to request time, provide TIA, or provide the required mitigation plan will result in Contractor waiving its right to a time extension and cost to mitigate the delay.
- D. No time will be granted under this Contract for cumulative effect of changes.
- E. City will not be obligated to consider any time extension request unless the Contractor complies with the requirements of Contract Documents.
- F. Failure of the Contractor to perform in accordance with the current schedule update shall not be excused by submittal of time extension requests.
- G. If the Contractor does not submit a TIA within the required fourteen (14) calendar days for any issue, it is mutually agreed that the Contractor does not require a time extension for said issue.

**1.14 SCHEDULE REPORTS**

- A. Submit one hard copy in addition to electronic submittal of the following reports with the Initial CPM Schedule, the Original CPM Schedule, and each monthly update.
- B. Required Reports:
  - 1. Two activity listing reports: one sorted by activity number and one by total Project Float. These reports shall also include each activity's early/late and actual start and finish dates, original and remaining duration, Project Float, responsibility code, and the logic relationship of activities.



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2. Schedule plots presenting time-scaled network diagram showing activities and their relationships with the controlling operations or critical path clearly highlighted.
  3. Cash flow report calculated by early start, late start, and indicating actual progress. Provide an exhibit depicting this information in graphic form.
  4. Planned versus actual resource (i.e., labor) histogram calculated by early start and late start.
- C. Other Reports: In addition to above reports, City may request, from month to month, any two of the following reports. Submit four (4) copies of all reports.
1. Activities by early start.
  2. Activities by late start.
  3. Activities grouped by Subcontractors or selected trades.
  4. Activities with scheduled early start dates in a given time frame, such as fifteen (15) or thirty (30) day outlook.
- D. Furnish City with report files on compact disks containing all schedule files for each report generated.

**1.15 PROJECT STATUS REPORTING**

- A. In addition to submittal requirements for CPM scheduling identified in this Section, Contractor shall provide a monthly project status report (i.e., written narrative report) to be submitted in conjunction with each CPM Schedule as specified herein. Status reporting shall be in form specified below.
- B. Contractor shall prepare monthly written narrative reports of status of Project for submission to City. Written status reports shall include:
1. Status of major Project components (percent (%) complete, amount of time ahead or behind schedule) and an explanation of how Project will be brought back on schedule if delays have occurred.
  2. Progress made on critical activities indicated on CPM Schedule.
  3. Explanations for any lack of work on critical path activities planned to be performed during last month.
  4. Explanations for any schedule changes, including changes to logic or to activity durations.
  5. List of critical activities scheduled to be performed next month.
  6. Status of major material and equipment procurement.
  7. Any delays encountered during reporting period.
  8. Contractor shall provide printed report indicating actual versus planned resource loading for each trade and each activity. This report shall be provided on weekly and monthly basis.
    - a. Actual resource shall be accumulated in field by Contractor, and shall be as noted on Contractor's daily reports. These reports will be basis for information provided in computer-generated monthly and weekly printed reports.
    - b. Contractor shall explain all variances and mitigation measures.
  9. Contractor may include any other information pertinent to status of Project. Contractor shall include additional status information requested by City at no additional cost.
  10. Status reports, and the information contained therein, shall not be construed as claims, notice of claims, notice of delay, or requests for changes or compensation.



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**1.16 WEEKLY SCHEDULE REPORT**

- A. At the Weekly Progress Meeting, the Contractor shall provide and present a time-scaled three (3) week look-ahead schedule that is based and correlated by activity number to the current schedule (i.e., Initial, Original CPM, or Schedule Update).
- B. Three-week schedule projections shall cover a twenty-eight (28) day period showing the week prior to the date the schedule is submitted, and the next three weeks.
- C. Use the Contract Schedule as the basis for generating the three-week look ahead schedule.
- D. Submit three (3) copies of the schedule in addition to any additional copies necessary during the weekly progress meeting.
- E. Format:
  - 1. Provide activity identification used on the accepted Contract Schedule.
  - 2. Provide daily resource allocation for each trade.
  - 3. Provide exact activity location for scheduled Work.
- F. Provide information for each significant construction activity, with special care taken to describe scheduling and coordination with other contracts and Work by the City.

**1.17 DAILY CONSTRUCTION REPORTS**

- A. On a daily basis, Contractor shall submit a daily activity report to City for each workday, including weekends and holidays when worked. Contractor shall develop the daily construction reports on a computer-generated database capable of sorting daily Work, manpower, and man-hours by Contractor, Subcontractor, area, sub-area, and Change Order Work. Upon request of City, furnish computer disk of this data base. Obtain City's written approval of daily construction report data base format prior to implementation. Include in report:
  - 1. Project name and Project number.
  - 2. Contractor's name and address.
  - 3. List of subcontractors at Project site.
  - 4. List of separate contractors at Project site.
  - 5. Accurate count of total number of personnel at Project site, including Subcontractors of any tier, including classification. Manpower shall be broken down by trade classification such as foreman, journeyman, or apprentice.
  - 6. Work performed on project, including location. Descriptions shall be referenced to CPM scheduled activities
  - 7. High and low temperatures and general weather conditions.
  - 8. Equipment on site, other than hand tools, utilized by Contractor and Subcontractor, whether active and/or idle.
  - 9. Inspections initiated and/or completed.
  - 10. Accidents, near misses, and unusual events.
  - 11. Meetings and significant decisions.
  - 12. Unusual events.
  - 13. Stoppages, delays, shortages, and losses.
  - 14. Strikes.
  - 15. Meter readings and similar recordings.
  - 16. Emergency procedures.
  - 17. Orders and requests of authorities having jurisdiction.
  - 18. Field Instructions received and implemented.
  - 19. Change Orders received and implemented.
  - 20. Services connected and disconnected.



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21. Equipment or system tests and startups.
22. Deliveries
23. Partial Completions and occupancies.
24. Photographs, clearly labeled with time, location, and description.

**1.18 PROJECT AS BUILT MAINTENANCE**

- A. Produce and maintain a clean, undamaged set of full-size prints of Contract Drawings and Shop Drawings. Complete entries in a neat, clear, and professional manner. Mark the set to show the actual installation where the installation varies from the Work as originally shown. Give particular attention to concealed elements that would be difficult to measure and record at a later date. Legibly record actual construction of the following: (Where applicable).
  1. Mark changes to the Documents caused by RFI responses with RFI designation. Post details not issued with original Contract Drawings such as sketches, etc.
  2. Changes authorized by approved Proposal Request, Construction Change Directives or by Change Orders.
  3. Depth of foundation with relation to finish first floor.
  4. Field changes of dimensions and details.
  5. Horizontal and vertical locations (with measurements/elevation) of underground utilities and appurtenances, with references to permanent surface improvements.
    - a. Underground utilities located where new installed utilities cross other existing utilities. If the utility is not on the City as-builts or plans, the contractor shall indicate the existing utility encountered (even if removed across trench). Include type (if known), size, elevation at intersecting utilities, and depict general direction of unknown utility on the project as-builts.
    - b. Every 100 feet along underground utilities.
    - c. At all bends / turns / transitions.
    - d. If utilities shown on the campus drawings are not where shown, this shall be indicated on the as-built drawing with the adjustment of actual location indicated where possible.
  6. Provide picture document of:
    - a. Underground piping (show long sections, with recognizable backgrounds where possible) for reference prior to backfill.
    - b. Walls after Mechanical Electrical Plumbing (MEP) completion and sign off but prior to insulation and drywall.
    - c. Rebar prior to closing forms and before concrete pours.
    - d. Concrete slabs after placement (within 24 hours).

**1.19 PERIODIC VERIFIED REPORTS**

- A. Contractor shall complete and verify construction reports on a form prescribed by the Division of the State Architect and file reports at the completion of the Contract; at the completion of the Work; at the suspension of Work for a period of more than one (1) month; whenever the services of Contractor or any of Contractor's Subcontractors are terminated for any reason; and at any time a special verified report is required by the Division of the State Architect. Refer to section 4-336 and section 4-343 of Part 1, Title 24 of the California Code of Regulations.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

**END OF SECTION**

**SECTION 01 32 33**  
**PHOTOGRAPHIC DOCUMENTATION**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Preconstruction photography.
  - 2. Construction photography and time-lapse photography of work-in-progress.

**1.02 GENERAL**

- A. Provide photographs at locations designated by Architect, including aerial views.
- B. Photographer: Specialist, experienced in taking construction photography and time-lapse photography.
- C. Equipment:
  - 1. As necessary to photograph both interior and exterior exposures.
  - 2. Utilize full range of lenses, including wide-angle, telephoto and 360 degree.
  - 3. If drones are used for aerial views, provide proof of FAA Certificated Drone Pilot and Drone Insurance.

**1.03 SUBMITTAL REQUIREMENTS**

- A. Make photo submittals, to Owner and Architect, along with each monthly Application for Payment.
- B. Electronic Format:
  - 1. Submit electronic files in JPEG format produced by a digital camera with a minimum resolution of not less than 3200 by 2400 pixels with a minimum sensor size of 8 megapixels.
  - 2. Submit without alteration, manipulation, editing, or modifications using image-editing software.
  - 3. Date and Time: Include date and time in file name for each image.
- C. Cloud-based web application for 360-degree images shared with the Owner, Architect, and Contractor.

**1.04 PRECONSTRUCTION PHOTOGRAPHS**

- A. Take photographs prior to beginning the Work of this Contract.
- B. Provide 20 Project Site photographs, including one aerial view.

**1.05 CONSTRUCTION PHOTOGRAPHS**

- A. Construction progress photography shall use both still and 360-degree photography to photo document work progress and site conditions. 360-degree photography shall use a cloud-based web application or program that allows photos to be organized and displayed on plan view drawings and accessed in real time by the Owner, Architect, and project team. At project closeout, deliver to the Owner and Architect a stand-alone PDF export of the entire project photo documentation.
  - 1. Take construction photographs, beginning two weeks after the last preconstruction photograph, and continuing every other week for the duration of the Work.
  - 2. Take a minimum of one photo per area within the structure. For areas greater than 500 square feet, take one photo for every 250 square feet of area. Take additional photographs as needed to fully document the Project.
  - 3. Take one exterior photo every 300 square feet of building perimeter. Take additional photographs as needed to fully document the Project.



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- B. At Project Closeout, deliver an archived set of all original image files on secure digital media for the Owner's record.

**PART 2 PRODUCTS (NOT USED)**

**PART 3 EXECUTION (NOT USED)**

**END OF SECTION**

**SECTION 01 33 00  
SUBMITTAL PROCEDURES**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. General: This Section specifies administrative and procedural requirements for submittals required for performance of the Work.
- B. Submittals for Architect's or Other Consultant's Action: Submittals which require the Architect's or other Consultants' responsive action are defined in this and other Specifications Sections, and include but not limited to:
  - 1. Shop Drawings.
  - 2. Product Data.
  - 3. Samples.
- C. Submittals for Information: Submittals which do not require the Architect's responsive action are defined in this and other Specifications Sections, and include but are not limited to the following:
  - 1. Calculations.
  - 2. Certifications.
  - 3. Test reports.
  - 4. Design data.
  - 5. Qualification data.
  - 6. Manufacturer's instructions and/or field reports.
  - 7. Maintenance data.
  - 8. Coordination drawings or other coordination information.
  - 9. Construction Schedule.
  - 10. Construction photographs or video.
- D. Related Documents
  - 1. Refer to General Conditions and other Division 1 sections for other requirements governing Shop Drawings, Product Data and Samples and other type submittals.
  - 2. Section 01 77 00 "Contract Closeout" specifies requirements for submittal of Project Record Documents, including copies of final Shop Drawings, at project closeout.



## **SECTION 01 33 00 SUBMITTAL PROCEDURES**

## **DIVISION 01**

### **1.2 GENERAL REQUIREMENTS FOR SUBMITTALS**

- A. Submittals Schedule: Comply with requirements in Section 01 32 00 "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.
- B. Submittals Log: Comply with Section 01 32 00 "Construction Progress Documentation" for the requirements for the single project "Submittals Log" utilizing web-based collaboration software.

### **1.3 GENERAL REQUIREMENTS FOR ELECTRONIC DOCUMENTATION**

- A. CAD Drawings: At Contractor's written request, electronic copies of Project CAD Drawings of the Contract Drawings will be provided by the Architect and the Architect's consultants for Contractor's use in preparing submittals. Refer to General Conditions, for other requirements governing electronic copies of Contract Documents. The Contractor shall be solely responsible for verifying the accuracy of all results created with the use of the CAD Drawings in electronic form.
  - 1. Receipt of files in electronic format does not relieve the receiver of responsibilities for measurements, dimensions and quantities set forth in Contract Documents. In event of ambiguity, discrepancy or conflict between information on electronic media and that in Contract Documents, notify Architect of discrepancy and use information contained within hard copy Drawings and Specifications.
  - 2. The Contractor shall be responsible for removing information not normally provided on Shop Drawings, including Architect's or other Consultants title block and any references to the Contract Documents. Shop Drawings and other type submittals submitted with information associated with other trades or with references to Contract Documents will not be reviewed and will be immediately returned.

### **1.4 WEB-BASED PROJECT MANAGEMENT SYSTEM**

- A. Web Based Project Management Software: It is the intention of this project to utilize an Internet based project management software platform as a collaborative tool to track and report on the progress of the Work. After the Contract for Construction is signed and before construction starts, a meeting will be held whereupon agreement between the parties shall be reached as to which web based project management platform will be utilized on the project.
- B. The Contractor shall provide and administer a web based project management platform that provides for the documentation, exchange and archiving of submittals, Requests for Information (RFI's) and other project related data as agreed upon and shall maintain an up to date required logs on platform. All submittals are to be made in an acceptable electronic format and posted on the platform. Hard copies will not be accepted. The following software platforms will be considered:
  - 1. Procore
  - 2. PlanGrid





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SUBMITTAL PROCEDURES**

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3. Newforma
4. Prolog
- C. Project Web site shall include the following minimum functions:
  1. Project directory.
  2. Project correspondence.
  3. Meeting minutes.
  4. Contract modifications forms and logs.
  5. RFI forms and logs.
  6. Task and issue management.
  7. Photo documentation.
  8. Schedule and calendar management.
  9. Submittals forms and logs.
  10. Payment application forms.
  11. Drawing and specification document hosting, viewing, and updating.
  12. Online document collaboration.
  13. Reminder and tracking functions.
  14. Archiving functions.
  15. Web Based Project Management Platform Administration: The Contractor shall administer the web-based construction project management software.
    - a. The project site will be organized by incoming and outgoing shop drawing folders and subdivided by CSI specification section.
    - b. The Architect and Contractor shall notify each other of shop drawing file uploads using the software's email notification feature. The time of upload shall serve as the record of file transfer from/to both Architect and Contractor.
    - c. The Architect shall be given administration rights to allow creation of new folders within the site and to control access and viewing rights to those folders.
- D. Submittals: Submittals shall be logged into web based as per agreed upon format and shall contain the following information:



## **SECTION 01 33 00 SUBMITTAL PROCEDURES**

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1. Contractor's and [Trade] [Subcontractors] names responsible for submission.
  2. Type of submission as defined herein.
  3. Specification section number where item is specified.
  4. Submission number 1st, 2nd, 3rd, etc. depending on previous submission for same items
  5. Dates: Date submitted (Date leaving Contractor's office) to reviewer, date received by reviewer, date returned and received by Contractor. Name of firms and individuals copied submitted to for info or follow-up and final review. All re-submissions shall be documented in a similar procedure until approvals are received.
  6. Actions as specified herein.
- E. Electronic Submittal Requirements
1. Submittals Requiring Actions
    - a. Shop Drawings for Action: Drawings shall be submitted and uploaded in PDF format to the web based platform unless otherwise specified. For clarity, drawings will be directly printed to PDF format from original application software, not scanned.
    - b. Product Data for Action: Data sheets, catalogue cuts, manufacturer's specifications, assembly documentation, compliance with recognized trade association standards, compliance with recognized testing agency standards etc. shall be submitted and uploaded in PDF format to the web based platform. Where printed Product Data includes information on several products, some of which are not required, mark submission to indicate the applicable information.
    - c. Samples for Action: Transmittals for samples shall be posted as a submittal on the web based platform. The Architect shall return comments via the extranet site and the physical sample will be returned when it is necessary to return it, as determined by the architect. The logging of sample delivery date and time shall occur at the time of delivery to the Architect's or other Consultants office, not at the time of transmittal posting to the extranet site.
  2. Submittals for Information
    - a. Calculations, Performance Data and Design Data: Provide PDF format submissions noting name of appropriate independent testing agency, name of professional engineer performing calculations, date completed and other pertinent information which will allow a complete review.
    - b. Certifications, Material Test Reports, Product Test Reports, Research/Evaluation Reports and Similar Reports: Provide PDF format submissions pertinent information which will allow a complete review.

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- c. Coordination Drawings: Coordination drawings shall be submitted and uploaded in PDF format to the web based platform unless otherwise specified. For clarity, drawings will be directly printed to PDF format from original application software, not scanned. If required by the Architect, coordination drawings may be required to be submitted in original native software format.
3. Design Review Stamp: The Contractor/Subcontractor transmitting the submittal shall electronically place the "Design Review Stamp" (as noted at the end of this specification section) and the Contractor "Reviewed Stamp" on all submittals requiring 'actions' such as shop drawings, product data sheets, catalog cuts, samples, etc. and for all submittals "for information" such as calculations, certifications test reports, maintenance data, etc.

**1.5 GENERAL REQUIREMENTS FOR SUBMITTALS**

- A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.
  1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals and related activities.
  2. Where architectural or technical considerations require close coordination of a number of products, the Contractor shall coordinate a concurrent submittal of such products.
  3. The Architect or other Consultants reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- B. Contractor's Responsibilities: The Contractor is responsible for the scheduling and submission of submittals.
  1. Submittal Schedule: The Contractor is responsible for the preparation, submission and updating of the Submittal Schedule in accordance with Section 01 32 00 "Construction Progress Documentation". Submittals shall be forwarded in accordance with the agreed upon "Submittal Schedule" and then redirected to the appropriate parties for review.
  2. Submittal Log: The Contractor is responsible for the preparation, submission and updating of the Project "Submittals Log" in accordance with Section 01 32 00 "Construction Progress Documentation".
  3. It shall be the Contractor's responsibility to carefully, thoroughly and fully review submittals to ensure conformance with the Contract requirements which shall include dimensions, clearances, compatibility, and coordination with product data and shop drawings submitted for other work. Submission of submittals to the Architect or other Consultants shall be construed as an acknowledgment that the Contractor has reviewed, coordinated and approved the submittal and that the entire submittal is in compliance with the Contract Documents.



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- a. If the Contractor has not checked submittal carefully, the submittals shall be returned to the Contractor for proper checking before further processing or review by the Architect or other Consultants regardless of any urgency claimed by the Contractor. In such a situation, the Contractor will be responsible for any resulting delays to the scheduled Contract completion. Furthermore, the Owner may hold the Contractor responsible for increased costs resulting from the Contractor's failure to comply with the requirements set forth herein.
4. Submittals shall be marked to show the Contract name and number, the Architect or other Consultants, Contractor, and applicable subcontractor, manufacturer or supplier. Submittals shall completely identify the specification section, Contract Drawings, and the locations at which materials or equipment are to be installed.
5. Where printed materials describe more than one product or model, clearly identify which is submitted for review.
6. No extension of Contract time will be authorized because of failure to transmit submittals to the Architect or other Consultants sufficiently in advance of the Work to permit the time specified for review and processing. Furthermore, the Contractor shall provide submittals in accordance with the agreed upon Submittal Schedule. Should the Contractor vary from the agreed upon schedule in their submissions, such that the number of submissions made at one time is greater than the Architect's scheduled staffing, additional time will be allowed as is reasonable and necessary for the proper review of submittals. This additional time shall in no way relieve the Contractor from performing their work on schedule. Resubmissions shall be treated the same as initial submissions with respect to review time.
7. Notations by the Architect or other Consultants which the Contractor believes will increase Contract cost or time of completion shall be brought to the Architect's or other Consultant's attention before proceeding with the Work. The Owner will not acknowledge increases to the Contract time or cost alleged by the Contractor as resulting from the Architect's or other Consultant's review of submittals unless written authorization is received from the Owner prior to fabrication of any part of the Work.
- C. Design Review Stamp: The Contractor/Subcontractor shall place the Architect's, Individual Consultant's, (etc.) " Design Review Stamp" and the Contractor "Reviewed Stamp" on shop drawing title blocks and submissions for catalog cuts, samples, calculations, etc. Contractor/Subcontractor shall supply separate sheet for each item submitted.
  1. Architect will supply the electronic version of shop drawing design review stamp for use by Contractor/Subcontractors.
- D. Architect's or other Consultant's Review of Submittals: The review of submittals by the Architect or other Consultants will be for general conformance with the requirements of the Contract Documents only and shall not be interpreted as a checking of detailed dimensions, quantities or approval of deviations from the Contract Documents. The Architect's or other Consultant's review shall not relieve the Contractor of its responsibility for accuracy of the submittals nor for the furnishing and installation of materials or



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equipment in accordance with Contract requirements. The Architect's or other Consultant's review of a separate item shall not indicate review of the complete assembly in which it functions.

1. Review of submittals is not to be interpreted as an analysis of a substitute material or system nor utilized for a "Request for Information". Review of substitutions will be accomplished in accordance with the requirements set forth in Specification Section 01 60 00, "Product Requirements" and 00 43 s5 "Substitutions". Procedure for "Request for Information" shall be in accordance with the requirements set forth in Specification Section 01 31 00, "Project Management and Coordination".
  2. Allow enough time for submittal review, including time for resubmittals. 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. The Architect will review submittals in 10 working days of receipt in the Architect's office and will return them to the Contractor with the Design Review Stamp applied. Notations by the Architect which increase contract cost or time of completion shall be brought to the Architect's attention before proceeding with the Work. Failure to do so indicates the Contractor agrees that notations do not represent additional cost or time.
- E. Unsolicited Submittals: The Architect or other Consultant will return unsolicited submittals to the sender without action. The term "unsolicited means "given, sent, or received without being requested".
- F. Resubmissions: Resubmittal procedure shall follow the same procedures as the initial submittal with the following exceptions:
1. Resubmission shall contain the same information as the first submission except that submission numbers shall run consecutively and the submission number shall indicate 2nd, 3rd, etc. submission. The drawing number/description shall be identical to the initial submission and the date shall be the revised date for that submission.
  2. No new material shall be included on the same resubmission.
  3. On resubmissions of shop drawings, the Architect's or other Consultant's review shall be generally restricted to review of revisions to the original shop drawing. Changes (revisions) to re-submitted shop drawings must be clearly encircled or otherwise highlighted.
  4. The Contractor shall bear the cost of reviews for unchecked. comments

### **1.2 SUBMITTALS FOR ARCHITECT'S OR OTHER CONSULTANT'S ACTION**

#### **A. Shop Drawings**

1. Shop drawings shall be project specific and show in detail, materials, dimensions, thicknesses, assembly, attachments, relation to adjoining work, compliance with specified standards, notations of coordination requirements, and other pertinent data and information. Do not reproduce Contract Documents or

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copy standard printed information as the basis of Shop Drawings. Shop drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates and similar drawings. In checking shop drawings, verify dimensions and field conditions and check and coordinate the shop drawings of any section or trade with the requirements of other sections or trades as related thereto, as required for proper and complete installation of the Work.

2. Prepare composite shop drawings and installation layouts, of ceiling finishes, trades above ceilings and elsewhere as directed by the Architect or other Consultants to depict proposed solutions for tight field conditions. These composite shop drawings and field installation layouts shall be coordinated in the field by the Contractor and its subcontractors for proper relationship to the work of other trades, based on field conditions.
3. Submit shop drawings, drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Reproductions of Contract Documents will not be acceptable. Where schedules are required to indicate locations, they shall be submitted as part of the shop drawing submission for that item. Shop drawings and schedules shall repeat the identification shown of the Contract Documents.
4. The submission of shop drawings shall include:
  - a. Clear adequate space on submitted shop drawings for the reviewer's Shop Drawing Review Stamp as shown in attachments at end of this specification section.
  - b. The Contractor shall not use or distribute for construction purposes any shop drawings that do not include the design review stamp.
5. The Architect or other Consultants will review shop drawings and return the drawings to the Contractor for revision, processing or resubmission. The Contractor is responsible for distributing approved prints of shop drawings to its subcontractors and materials suppliers.
6. The Contractor shall bear costs incurred for such reproduction and distribution.

**B. Product Data**

1. Compile Product Data into a single submittal for each element of construction or system. Product Data includes, among other information, printed information such as manufacturer's installation instructions, compliance with trade association standards, catalog cuts, standard color charts, compliance with recognized testing agency standards, notations of coordination requirements, roughing-in diagrams and templates, standard wiring diagrams and performance curves. Where Product Data must be specially prepared because standard printed data is inadequate, submit as "Shop Drawings".
2. The submission of product data literature shall include the following:
  - a. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products, some of which



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are not required, mark copies to indicate the applicable information.  
Include the following information:

- 1) Manufacturer's printed recommendations.
  - 2) Compliance with recognized trade association standards.
  - 3) Compliance with recognized testing agency standards.
  - 4) Application of testing agency labels and seals.
  - 5) Notation of dimensions verified by field measurement.
  - 6) Notation of coordination requirements.
- b. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.

**C. Samples**

1. The Contractor shall submit sample(s) to the Architect or other Consultants as required in the specifications or as may be requested by the Architect or other Consultants. Costs associated with sample submittals shall be borne by the Contractor.
  - a. Quantity: Each required sample must be submitted in quantities as required by each technical specification section, or if not specified, a minimum of three (3). Refer to technical specifications sections for samples to be returned to the Contractor for incorporation in the Work. Such samples shall be undamaged at time of use.
  - b. Labels: Every sample submittal shall have a label showing:
    - 1) Project Name, Contract title and number.
    - 2) Contractor's name, name of individual forwarding item.
    - 3) Architect's or other Consultant's name.
    - 4) Description of item represented.
    - 5) Manufacture's data sheets and drawings, and other information as applicable.
  - c. Applicable Specification Section and Contract drawing number(s).
2. Approval of samples will not preclude the rejection of the completed Work, if completed Work deviates from the sample submitted or does not otherwise comply with other Contract requirements. Samples shall show anticipated range of color and/or texture. The Architect or other Consultant may require additional submissions if the range is not satisfactory.

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3. Preliminary Sample Submittals: Where Samples are for selection of color, pattern, texture or similar characteristics from a range of standard choices, submit a full set of choices for the material or product.
    - a. Preliminary sample submittals will be reviewed and returned with the Architect's or other Consultant's mark indicating selection and other action required.
  4. Maintain two (2) sets of approved Samples at the Project site, for the purpose of comparison throughout the course of construction.
  5. Field Samples required by individual Specification Sections are mock-ups erected on site to illustrate finishes, coatings, or textures and to establish the standard by which the Contract Work will be judged. Mock-ups shall be provided in the sizes prescribed in the Contract Documents or as may be required by the Architect.
    - a. Comply with submittal requirements, and process transmittal forms to provide a record of the submittal.
  6. Samples of materials which are generally furnished in containers bearing manufacturer's descriptive labels and printed application instructions shall, if not submitted in standard containers, be furnished with such labels and application instructions.
- D. Marking of Action Submittals: Each submittal shall be stamped with the Design Review Stamp and marked with the appropriate action as follows:
1. "A - APPROVED" means that fabrication, manufacture, or construction may proceed providing submittal complies with the Contract Documents.
  2. "B - APPROVED AS NOTED" means that fabrication, manufacture, or construction may proceed providing submittal complies with the Reviewer's notations and the Contract Documents. When noted, resubmit for verification that comments have been complied with. If, for any reason, Contractor cannot comply with the notations, Contractor shall make revisions and resubmit as described for submittals stamped "C REVISE AND RESUBMIT".
  3. "C - REVISE AND RESUBMIT" means that a portion of the submittal does not comply with the design intent of the Contract Documents and that fabrication, manufacture, or construction may not proceed. Contractor shall make revisions and resubmit entire submittal only revising portions as noted.
  4. "D - REJECTED" means that submittal does not comply with the design intent of the Contract Documents and that fabrication, manufacture, or construction may not proceed. Submittals stamped "D - REJECTED" are not to be used. Contractor shall make revisions and resubmit.
- E. Distribution of Action Submittals:
1. Contractor shall make any corrections required and shall resubmit corrected shop drawings or new samples until stamped "A - APPROVED" or "B -





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APPROVED AS NOTED". Contractor shall direct specific attention in writing to revisions other than the corrections requested.

2. No portion of the Work requiring a shop drawing or sample submission shall be commenced until the submission has been reviewed and actioned "A - APPROVED" or "B - APPROVED AS NOTED" in writing. Such portions of the Work shall be in accordance with reviewed shop drawings and samples.

### **1.3 SUBMITTALS FOR INFORMATION**

#### **A. Calculations, Performance and Design Data**

1. Calculations, performance and design data are the mathematical data specifically prepared for the Work by the Contractor or any subcontractor, manufacturer, supplier or distributor which demonstrate, by use of legitimate accepted engineering principles, that a portion of the Work satisfies the performance and design criteria established in the Contract Documents. Include list of basis of design calculations, assumptions, load diagrams, summary of loads if applicable and other performance and design criteria.
2. Only those calculations, performance and design data which are for permanent parts of the Work will be reviewed by the [Architect] [Engineer]. These calculations, performance and design data will be reviewed only for compliance with stipulated design criteria.

#### **B. Certifications: Where Sections of the Specifications require certification that a product, material, or installation complies with specified requirements, submit a certification certifying compliance with specified requirements. Certification shall be signed by an officer of the company or other individual authorized to sign documents on behalf of the company.**

1. **Installer Certificates:** Prepare 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. Include evidence of manufacturing experience where required.
2. **Manufacturer Certificates:** Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
3. **Product and Material Certificates:** Prepare written statements on manufacturer's letterhead certifying that product or material complies with requirements in the Contract Documents.
4. **Welding Certificates:** Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

#### **C. Material Test Reports: Prepare reports written by an approved qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for**



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compliance with requirements in the Contract Documents.

- D. Product Test Reports: Prepare written reports indicating 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.
- E. Research/Evaluation Reports: Prepare 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:
  - 1. Name of evaluation organization.
  - 2. Date of evaluation.
  - 3. Time period when report is in effect.
  - 4. Product and manufacturers' names.
  - 5. Description of product.
  - 6. Test procedures and results.
  - 7. Limitations of use.
- F. Preconstruction Test Reports: Prepare reports written by an approved 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.
- G. Compatibility Test Reports: Prepare reports written by an approved qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- H. Field Test Reports: Prepare reports written by an approved qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- I. Coordination Drawings: Coordination drawings are drawings that detail the relationship and integration of different construction elements that require careful coordination during fabrication or installation.
  - 1. The Contractor shall prepare and submit coordination drawings of involved trades in a scale of not less than 1/4 in. = 1 ft. (1:50) or larger, as required by the Architect or other Consultants, for integration of different construction elements. Show sequences and relationships of separate components to avoid conflicts in use of space. Any Work installed prior to review of coordination drawings shall be at the Contractor's risk and subsequent relocations required to avoid interference shall be made at no additional cost.



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- J. Marking of Informational Submittals: Each submittal shall be stamped with the Design Review Stamp and marked with the appropriate comments as follows "Information Only"
1. Submittals reviewed and without annotations or comments shall be stamped "INFORMATION - NO COMMENTS".
  2. "Information Only" Submittals reviewed and with annotations or comments shall be stamped "INFORMATION - COMMENTS AS NOTED".
  3. Distribution of Information Submittals: Submittals of calculations for permanent parts of the structure will be reviewed only for compliance with stipulated design criteria. Each submittal will be stamped to indicate whether or not comments have been made.

**PART 2 – PRODUCTS (NOT APPLICABLE)**

**PART 3 – EXECUTION (NOT APPLICABLE)**



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**STAMP FOR SUBMITTALS EXAMPLE**

<b>Jeffrey Miller Architecture and Design Corporation</b>			
516 N Sepulveda Manhattan Beach, CA 90266			
Review and approval are only for conformance with the information given and the design concept of the Project as expressed in the Contract Documents, and not for the purpose of determining the accuracy and completeness of other details, such as dimensions and quantities, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review and approval of the Contractor's submittals shall <u>not</u> relieve the Contractor from any obligation contained in the Contract Documents.			
	<b>A</b>	APPROVED	Fabrication, installation or construction may proceed. Approval does not authorize changes in Contract Sum or Contract Time
	<b>B</b>	APPROVED AS NOTED	
	<b>C</b>	REVISE AND RESUBMIT	Fabrication, installation, or construction MAY NOT proceed. In resubmitting, limit corrections to items marked.
	<b>D</b>	REJECTED	
INFORMATION ONLY:		<input type="checkbox"/> NO COMMENTS <input type="checkbox"/> COMMENTS AS NOTED	
Arch	Struct	Civil	
Mech	Elect	Other	
COUNTERSIGNED:			
BY:		DATE:	
SPEC. SECTION	FILE NO.	SUBMITTAL NO.	

**END OF SECTION**

**SECTION 01 42 00  
REFERENCE STANDARDS**

**PART 1 - GENERAL**

**1.01 GENERAL**

- A. Titles of Sections and Paragraphs: Titles and subtitles accompanying specification sections and paragraphs are for convenience and reference only and do not form a part of the Specifications.
- B. Applicable Publications: Whenever in these Specifications references are made to published specifications, codes, standards, or other requirements, it shall be understood that wherever no date is specified, only the latest specifications, standards, or requirements of the respective issuing agencies which have been published as of the date that construction is started shall apply; except to the extent that said standards or requirements may be in conflict with applicable laws, ordinances, or governing codes. No requirements set forth in the Standards & Specifications or shown on the Construction Drawings will be waived because of any provision of, or omission from, said standards or requirements.
- C. Specialists, Assignments: In certain instances, specification text requires (or implies) that specific work is to be assigned to specialists or expert entities, who must be engaged for the performance of that work. Such assignments shall be recognized as special requirements over which the Contractor has no choice or option. These requirements shall not be interpreted so as to conflict with the enforcement of building codes and similar regulations governing the work; also they are not intended to interfere with local union jurisdiction settlements and similar conventions. Such assignments are intended to establish which party or entity involved in a specific unit of work is recognized as "expert" for the indicated construction processes or operations. Nevertheless, the final responsibility for fulfillment of the entire set of contract requirements remains with the Contractor.

**1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS**

- A. The Contractor shall construct the work in accordance with the Contract Documents and the referenced portions of those referenced codes, standards, and specifications.
- B. References herein to "Building Code" or "Uniform Building Code" shall mean the Uniform Building Code of the International Conference of Building Officials (ICBO). Similarly, references to "Mechanical Code" or "Uniform Mechanical Code," "Plumbing Code" or "Uniform Plumbing Code," "Fire Code" or "Uniform Fire Code," shall mean Uniform Mechanical Code, Uniform Plumbing Code, and Uniform Fire Code of the International Conference of the Building Officials (ICBO). "Electrical Code" or "National Electrical Code (NEC)" shall mean the National Electric Code of the National Fire Protection Association (NFPA). Unless otherwise indicated, the latest edition of the codes as approved by the Municipal Code and used by the local agency as of the date that the work is advertised for bids, as adopted by the agency having jurisdiction, shall apply to the work herein, including all addenda, modifications, amendments, or other lawful changes thereto.
- C. In case of conflict between codes, reference standards, drawings, and the other Contract Documents, the most stringent requirements shall govern. All conflicts shall be brought to the attention of the City of Goleta for clarification and direction prior to ordering or providing any materials or furnishing labor. The Contractor shall bid for the most stringent requirements.
- D. References herein to "OSHA Regulations for Construction" shall mean Title 29, Part 1926, Construction Safety and Health Regulations, Code of Federal Regulations (OSHA), including all changes and amendments thereto.



**SECTION 01 42 00  
REFERENCE STANDARDS**

**DIVISION 01**

- E. References herein to "OSHA Standards" shall mean Title 29, Part 1910, Occupational Safety and Health Standards, Code of Federal Regulations (OSHA), including all changes and amendments thereto.
- F. References herein to Caltrans Standards and Specifications shall mean State of California Department of Transportation Standards and Specifications.
- G. Applicable Safety Standards: References herein to "Cal-OSHA" shall mean State of California, Department of Industrial Relations, Construction Safety Orders, as amended to date, and all changes and amendments thereto.
- H. References herein to ASTM shall mean American Society for Testing and Materials.
- I. References herein to "Greenbook" or "SSPWC" shall mean the Standard Specifications for Public Works Construction.
- J. References herein to County Standards and Specifications shall mean County of Santa Barbara, Department of Public Works, Standards and Specifications.
- K. References herein to City of Goleta Standards and Specifications shall mean City of Goleta, Department of Public Works, Standards and Specifications.

**1.03 REGULATIONS RELATED TO HAZARDOUS MATERIALS**

- A. The Contractor shall be responsible that all work included in the Contract Documents, regardless if shown or not, shall comply with all EPA, OSHA, RCRA, NFPA, and any other Federal, State, and Local Regulations governing the storage and conveyance of hazardous materials, including petroleum products.

**PART 2 – PRODUCTS (NOT USED)**

**PART 3 – EXECUTION (NOT USED)**

**END OF SECTION**

**SECTION 01 42 13  
ABBREVIATIONS, SYMBOLS AND ACRONYMS**

**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. List of abbreviations, symbols, and acronyms of societies, institutes, and associations generally appearing in the Contract Documents.

**1.02 RELATED REQUIREMENTS**

- A. Division 01 - General Requirements.

**PART 2 - PRODUCTS (NOT APPLICABLE)**

**PART 3 - EXECUTION**

**3.01 ABBREVIATIONS**

ac	Alternating current
AC	Asphaltic Concrete
ACC	Accessible
AFF	Above Finish Floor
ALUM	Aluminum
APN	Assessor Parcel Number
ALT	Alternate
amp	ampere
ASPH	Asphalt
ARCH	Architect
AUTO	Automatic
B/BOT	Bottom
BO	Blow Off
BC	Begin Curve
BCR	Begin Curve Return
BFV	Back Flow Valve
BLDG	Building
BVCE	Begin Vertical Curve Elevation
BVCS	Begin Vertical Curve Station
C	Degrees Centigrade, Celsius
CA	California
Cat 6	Category 6, unshielded twisted pair cabling
CB	Catch Basin
CFC	Chlorofluorocarbon
cfh	Cubic feet per hour
cfm	Cubic feet per minute
CLF	Chain Link Fence
CLR	Clear
cm	Centimeter
CMU	Concrete Masonry Unit
Co.	Company
COD	Curb Outlet Drain
Corp.	Corporation



**SECTION 01 42 13  
ABBREVIATIONS, SYMBOLS  
AND ACRONYMS**

**DIVISION 01**

COMM	Communications
CONC	Concrete
COST	Construction
CONT	Continuous
COORD	Coordination
CW	Crosswalk
d	Penny
db.	Decibel
DB	Dry bulb
DBL	Double
dc	Direct current
DEMO	Demolition
DIM	Dimension
DET	Detail
DIA	Diameter
DN	Down
DS	Downspout
DWG	Drawing
EC	End Curve
ECP	Electrical Control Panel
ECR	End Curve Return
EMT	Electrical Meter
EQ	Equivalent
EL	Elevation
EI	Electrical
EJ	Expansion Joint
EXT	Exterior
(E)/EXIST	Existing
EVCE	End Vertical Curve Elevation
EVCS	End Vertical Curve Station
ePTZ	Digital Pan Tilt Zoom
F	Degrees Fahrenheit
FC	Frontier Communications
fpm	Feet per minute
FIN	Finish
FF	Finish Floor
FH	Fire Hydrant
FLR	Floor
FOM	Face of Masonry
FPS	Frames per Second
Ft (')	Foot or feet
GA	Gage
GALV	Galvanized
gph	Gallons per hour





**SECTION 01 42 13  
ABBREVIATIONS, SYMBOLS  
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**DIVISION 01**

gpm	Gallons per minute
GB	Grade Break
GM	Gas Meter
GTD	Goleta Train Depot
GEN'L	General
GV	Gas Valve
GWD	Goleta Water District
HP	Horsepower
HR	Hour
HOA	Home Owner Association
HT	Height
HMA	Hot Mix Asphalt
Hz	Hertz
ICV	Irrigation Control Valve
ID	Inside Diameter
IN (" )	Inch
Inc.	Incorporated
INT	Intersection
IP	Internet Protocols
IR light	Infrared light
Kbps	Kilobits per Second
KHz	Kilohertz
Kip	thousand pounds
Ksf	Thousand pounds per square foot
Ksi	Thousand pounds per square inch
Kv	Kilovolt
KVA	Kilovolt amperes
KW	Kilowatt
KWH	Kilowatt hour
LED	Light Emitting Diode
LF	Linear foot
Lb(s)	Pound(s)
LCD	Liquid Crystal Display
LOL	Layout Line
LOC	Location
Lt	Light
Lux	A standard unit of illumination measurement
MAT	Material
Max	Maximum
MBH	1000 BTUs per hour
MECH	Mechanical
MFR	Manufacturer
MHz	Mega hertz
mil	Thousandth of an inch



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ABBREVIATIONS, SYMBOLS  
AND ACRONYMS**

**DIVISION 01**

Min	Minimum
mm	Millimeter
mph	Miles per hour
MISC	Miscellaneous
MTL	Metal
MBX	Mailbox
(N)	New
NA	Not Applicable
NIC	Not in Contract
NO	Number
NTS	Not to Scale
OC	On Center
OD	Outside Dimension
OFCI	Owner Furnished / Contractor Installed
OFOI	Owner Furnished / Owner Installed
OG	Original Ground
OPP	Opposite
oz.	Ounce
PCF	Pounds per cubic foot
pH	Acidity-alkalinity balance
PL	Property Line
PLAS	Plaster
PLYWD	Plywood
PoE	Power Over Ethernet – A standard for providing power over network cable
PP	Power Pole
psf	Pounds per square foot
psi	Pounds per square inch
psig	Pounds per square inch, gage
PTS	Pan–Tilt–Zoom
PVIE	Point of Vertical Intersection Elevation
PVIS	Point of Vertical Intersection Station
PVC	Polyvinylchloride
QoS	Quality of Service
R, RAD	Radius
RD	Road
REF	Reference
Rel	Relocate
RF	Radio frequency
Rmv	Remove
REINF	Reinforcement
RET	Return
Rplc	Replace
Rt	Right
REQ'D	Required



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ABBREVIATIONS, SYMBOLS  
AND ACRONYMS**

**DIVISION 01**

RSP	Revised Standard Plan
R/W	Right of Way
rpm	Revolutions per minute
SDK	Software Development Kit
SF	Square foot
SIM	Similar
SIP	Session Initiation Protocol
SMA	Software Maintenance Agreement
SPEC	Specification
SQ	Square
SS	Stainless Steel
STL	Steel
SCE	Southern California Edison
SCG	Southern California Gas Company
SL	Street Light
SPPWC	Standard Plans for Public Works Construction (Greenbook by APWA)
SR	State Route
SS	Sanitary Sewer
SSP	State Standard Plan
STD	Standard
STRUCT	Structural
SUSP	Suspended
SW	Switch or Sidewalk
SC	Sawcut
SSL	Secure Sockets Layer
SSM	Server Software Module
SY	Square yard
TCP	Transmission Control Protocol
T	Top
TCE	Temporary Construction Easement
TC	Top of Curb
TF	Top of Foundation
TOS	Top of Slab
TSB	Traffic Signal Box
TSPB	Traffic Signal Pull Box
TW	Top of Wall
THRESH	Threshold
TLS	Transport Layer Security
TYP	Typical
UI	User Interface
Unicast	Communication between a single sender and single receiver on network
UNO	Unless (Otherwise)
UON	Noted Otherwise
UP	Utility Pole



## SECTION 01 42 13 ABBREVIATIONS, SYMBOLS AND ACRONYMS

**DIVISION 01**

UPnP	Universal Plug and Play
V	Volts
Var	Variable
VERT	Vertical
VBR	Variable Bit Rate
VIF	Verify in Field
VMS	Video Management System
W	Watts
WB	Wet bulb
WD	Wood
WDR	Wide dynamic range
WO	Where Occurs
WP	Water Proof
WPJt	Weakened Plan Joint
WT	Weight
WWF	Welded Wire Fabric

### 3.02 SYMBOLS

#	Number or pound
'	Foot or feet
"	Inch(es)
%	Percent
°	Degree (Angle or Temperature)

### 3.03 ACRONYMS

AA	The Aluminum Association, Inc
AABC	Associated Air Balance Council
AAMA	American Architectural Manufacturers Association
AASHTO	American Association of State Highway and Transportation Officials
AATCC	American Association of Textile Chemists and Colorists
ABMA	American Boiler Manufacturers Association
ACI	American Concrete Institute
ACS	Access Control System
AEC	Automatic Echo Cancellation
ADA	Americans with Disabilities Act
ADAAG	Americans with Disabilities Act Accessibility Guidelines
AFF	Above Finish Floor
AGC	Automatic Gain Control
ALPR	License Plate Recognition
AGA	American Gas Association
AGC	Automatic Gain Control
AGCIH	American Conference of Governmental Industrial Hygienists
AI	Asphalt Institute
AIA	American Institute of Architects
AISC	American Institute of Steel Construction



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ABBREVIATIONS, SYMBOLS  
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AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
AMCA	Air Movement and Control Association, Inc.
ANI	Automatic Number Identification
ANSI	American National Standards Institute
APA	APA – The Engineered Wood Association
API	Application Programming Interface
ARI	Air-Conditioning and Refrigeration Institute
ARS	Automated Route Selection
ARP	Address Resolution Protocol
ATSC	Advanced Television Systems Committee
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATBCB	Architectural & Transportation Barriers Compliance Board
AWI	Architectural Woodwork Institute
AWPA	American Wood Preservers Association
AWPI	American Wood Preservers Institute
AWS	American Welding Society
AWWA	American Water Works Association
BBS	Backbone Switch
BGP	Border Gateway Protocol
BHMA	Builders Hardware Manufacturers Association
BIA	Brick Institute of America
BICSI	Building Industry Consulting Services, International
BRI	
BOOTP	Bootstrap Protocol
BTU	British thermal unit
CAL/OSHA	California Occupational Safety and Health Administration
CAC	Call Admission Control
CAS	Channel Associated Signaling
CAT 5e	Category 5e
CBC	California Building Code
CCR	California Code of Regulations
CCK	Complementary Code Keying
CDR	Call Detail Record
CEC	California Electrical Code
CESM	Compact Edge Switch-Managed
CFR	Code of Federal Regulations
CIF	Common Intermediate Format
CISPI	Cast Iron Soil Pipe Institute
CLFMI	Chain Link Fence Manufacturers Institute
CLI	Command Line Interface
CLID	Calling Line Identification



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ABBREVIATIONS, SYMBOLS  
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**DIVISION 01**

CMAS	California Multiple Award Schedule
CMC	California Mechanical Code
CNG	Comfort Noise Generation
CNID	Calling Party Name Identification
CQC	California Quality Control (CMA Standards)
Codec	Coder/Decoder
COP	Coefficient of performance
COS	Class of Service
CPC	California Plumbing Code
CRA	California Redwood Association
CSA	Client Software Application
CRI	Carpet and Rug Institute
CRSI	Concrete Reinforcing Steel Institute
CS	Commercial Standards, U.S. Department of Commerce
CS	Communications Server
CSFM	California State Fire Marshal
CSI	Construction Specifications Institute
CTIOA	Ceramic Tile Institute of America
CTI	Cooling Tower Institute
DHCP	Dynamic Host Configuration Protocol
DHI	Door and Hardware Institute
DHCP	Dynamic Host Configuration Protocol
DGM	Dynamic Graphical Map
DNS	Domain Name System
DTV	Digital Television
DSS	Direct Station Selection
DTMF	Dual Tone Multiple Frequency
DVD	Digital Video Disc
EER	Energy efficiency ratio
EIA	Electronic Industries Alliance
EIS	Electronic Image Stabilization
ESM	Edge Switch-Managed
E&M	Ear and Mouth
FAT	Field Acceptance Testing
FEP	Front End Processor
FEP	Fluorinated Ethylene Propylene
FPS	Frames per Second
FTP	File Transfer Protocol
FXS	Foreign Exchange Station
EPA	Environmental Protection Agency
ETL	ETL Testing Laboratories
FCC	Federal Communication Commission
FDA	Food and Drug Administration
FECC	Far End Camera Control



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FPS	Frames per Second
FM	Factory Mutual
FPS	Frames per Second
FS	Federal Specifications
FTP	File Transfer Protocol
FXO	Foreign Exchange Office
FXS	Foreign Exchange Station
GA	Gypsum Association
GANA	Glass Association of North America
GBIC	Gigabit Interface Converter
GUI	Graphical User Interface
GigE	Gigabit Ethernet
HMMA	Hollow Metal Manufacturer's Association
HPVA	Hardwood Plywood & Veneer Association
HTTP	Hypertext Transfer Protocol
HTTPS	Hypertext Transfer Protocol over SSL
HVAC	Heating, Ventilation, and Air Conditioning
IACS	International Annealed Copper Standards
IAMPO	International Association of Plumbing and Mechanical Officials
IC	Intercom
ICBO	International Conference of Building Officials
ICEA	Insulated Cable Engineers Association
ICMP	Internet Control and Message Protocol
ID	Identifier
IDF	Intermediate Distribution Frame
IEEE	Institute of Electrical & Electronic Engineers, Inc.
IDS	Intrusion Detection System
IEC	International Electro technical Commission
IES	Illuminating Engineering Society
IMI	International Masonry Institute
IOR	Inspector of Record
IP	Internet Protocol
IP Router	Internet Protocol Router
IPVC	Internet Protocol Video Conferencing
IPX	Internetwork Packet Exchange
IRI	Industrial Risk Insurers
ISDN	Integrated Services Digital Network
ISO	International Organization for Standardization
ISA	Industry Standard Architecture
ISDN	Integrated Services Digital Network
ISM	Intermediate Switch-Managed (Fiber Switch)
ISMS	Integrated Security Monitoring and Management System
ISP	Internet Service Provider
ITD	OWNER, Information Technology Division



**SECTION 01 42 13  
ABBREVIATIONS, SYMBOLS  
AND ACRONYMS**

**DIVISION 01**

ITU	International Telecommunication Union
IVR	Interactive Voice Response
JPEG	Joint Photographic Experts Group (image format)
Kbps	Kilobits per Second
LAN	Local Area Network
LCD	Liquid Crystal Display
LDC	Local Distribution - Cabinet
LDF	Local Distribution Frame
LED	Light Emitting Diode
LIU	Light Interconnection Unit
MAC	Media Access Control
MAN	Metropolitan Area Network
MBR	Maximum Bit Rate
MCU	Multipoint Conference Unit
MDF	Main Distribution Frame
MDF-BBS	Main Distribution Frame Backbone Switch
MIB	Management Information Base
MIC	Message Integrity Check
MLD	Multicast Listener Discovery
MLSFA	Metal Lath/Steel Framing Association
MPOE	Main Point of Entry
MPEG	Moving Picture Experts Group
MP-BGP	Multi-Protocol Border Gateway Protocol
MOS	Mean Opinion Scale
MSS	Manufacturers Standardization Society of the Valve & Fittings Industry.
NAAMM	National Association of Architectural Metal Manufacturers
NAT	Network Address Translation
NAT-PT	NAT Protocol Translation
NAS	Network Attached Storage
NBFU	National Board of Fire Underwriters
NBS	National Bureau of Standards
NCMA	National Concrete Masonry Association
NEBB	National Environmental Balancing Bureau
NEBS	Network Equipment Building System
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NEC	National Electrical Code
NFPA	National Fire Protection Association
NFPA	National Forest Products Association
NIC	Network Interface Card
NIOSH	National Institute for Occupational Safety and Health
NIST	National Institute of Standards and Technology
NMP	Simple Network Management Protocol
NOFMA	National Oak Flooring Manufacturers Association





**SECTION 01 42 13  
ABBREVIATIONS, SYMBOLS  
AND ACRONYMS**

**DIVISION 01**

NPCA	National Paint and Coatings Association
NPDES	National Pollutant Discharge Elimination System
NRCA	National Roofing Contractors Association
NSF	National Sanitation Foundation
NTP	Network Time Protocol
NTSC	National Television System Committee
NTMA	National Terrazzo & Mosaic Association
NTSC	National Television System Committee
NUSIG	National Uniform Seismic Installation Guidelines
NWMA	National Woodwork Manufacturers Association
OAR	OWNER Authorized Representative
OC-3	Optical Carrier Level-3 (~155 Mbps)
OEHS	Office of Environmental Health and Safety
OFNR	Optical Fiber Non-Conductive Riser
OFNP	Optical Fiber Non-Conductive Plenum
OID	Object Identifier
OPX	Off Premise Extension
OSHA	Occupational Safety & Health Administrations
OSI	Open Systems Interconnection
OSPF	Open Shortest Path First
OTDR	Optical Time Domain Reflectometer.
ONVIF	Open Video Interface Forum
OWAN	OWNER's Wide Area Network
OWNER	City of Goleta
PA	Public Address
PABX	Private Auxiliary Branch Exchange
PA/IC	Public Address/Intercommunications
PAL	Phase Alternating Line
PAT	Port Address Translation
PBX	Private Branch Exchange
PCA	Portland Cement Association
PCI	Precast/Prestressed Concrete Institute
PCM	Pulse Code Modulation
PDI	Plumbing and Drainage Institute
PEI	Porcelain Enamel Institute
PHB	Per Hop Behavior (DiffServ)
PIC	PBX Integration Card
PIM	Protocol-Independent Multicast
PING	Packet Internet Groper
PINX	Private Integrated Services Network Exchange
PIP	Picture in Picture
PMO	Project Management Office
PoE	Power-over-Ethernet
POP	Point of Presence



**SECTION 01 42 13  
ABBREVIATIONS, SYMBOLS  
AND ACRONYMS**

**DIVISION 01**

POTS	Plain Old Telephone System
PRI	Primary Rate Interface
PS	Product Standard, U.S. Department of Commerce
PSIP	Program and System Information Protocol
PSTN	Public Switched Telephone Network
PZM	Pressure Zone Microphone
QCIF	Quarter CIF – See CIF
QoS	Quality of Service
QSIG	Q-Signaling
RADIUS	Remote Access Dial-In User Service
RIP	Routing Information Protocol
RIPng	Routing Information Protocol Next Generation
RIS	Redwood Inspection Service
RMON	Remote Network Monitoring
RMON2	Remote Network Monitoring Version 2
SAN	Storage Area Network
SCAQMD	South Coast Air Quality Management District
SCSI	Small Computer System Interface
SDEI	Steel Deck Institute
SDI	Steel Door Institute
SFM	State Fire Marshal
SFP	Small Form-factor Pluggable transceiver
SFP+	Enhanced Small Form-factor Pluggable transceiver
SFPA	Southern Forest Products Association
SIF	Source input format (NTSC)
SIP	Session Initiation Protocol
SIGMA	Sealed Insulating Glass Manufacturers Association
SJI	Steel Joist Institute
SLC	Small Learning Community
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SMDI	Simple Message Desk Interface
SMI	Structure of Management Information
SMTP	Simple Mail Transfer Protocol
SMPTE	Society of Motion Picture and Television Engineers
SNA	Systems Network Architecture
SNMP	Simple Network Management Protocol
SSH	Secure Shell
SSID	Service Set Identifier
SSL	Secure Socket Layer
SSPC	Steel Structures Painting Council
S/P DIF	Sony/Philips Digital InterFace
SWI	Steel Window Institute
TEHO	Tail End Hop Off
TCA	Tile Council of America



**SECTION 01 42 13  
ABBREVIATIONS, SYMBOLS  
AND ACRONYMS**

**DIVISION 01**

TCP	Transmission Control Protocol
TFTP	Trivial File Transfer Protocol
TIA	Telecommunications Industry Association
TKIP	Temporal Key Integrity Protocol
TLS	Transport Layer Security
TOS	Type of Service
UBPPA	Uni-Bell PVC Pipe Association
UCI	Uniform Construction Index
UFAS	Uniform Federal Accessibility Standards
UL	Underwriters' Laboratories, Inc.
UM	Unified Messaging
UPS	Uninterruptible Power Supply
UPnP	Universal Plug and Play
URL	Uniform Resource Locator
USDA	United States Department of Agriculture
UTC	Coordinated Universal Time
UTP	Unshielded Twisted Pair
UPS	Uninterruptible Power Supply
USP	Unified Security Platform
USW	Unified Web Client
VAD	Voice Activity Detection
VBR	Variable Bit Rate
VLAN	Virtual Local Area Network
VM	Voice Mail
VSS	Video Surveillance System
VoD	Video on Demand
VFD	Vacuum Fluorescent Display
VTC	Video Teleconference
WAN	Wide Area Network
WDR	Wide dynamic range
WLAN	Wireless Local Area Network
WCLIB	West Coast Lumber Inspection Bureau
WDMA	Window and Door Manufacturers Association
WWPA	Western Wood Products Association

**END OF SECTION**

**SECTION 01 45 23  
TESTING AND INSPECTION**

**PART 1 - GENERAL**

**1.01 REFERENCE STANDARDS**

- A. AISC 341 - Seismic Provisions for Structural Steel Buildings.
- B. AISC 360 - Specification for Structural Steel Buildings.
- C. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
- D. ASTM A370 - Standard Test Methods and Definitions for Mechanical Testing of Steel Products.
- E. ASTM C780 - Standard Test Methods for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
- F. ASTM C1314 - Standard Test Method for Compressive Strength of Masonry Prisms.
- G. ASTM E164 - Standard Practice for Contact Ultrasonic Testing of Weldments.
- H. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing.

**1.02 SECTION INCLUDES**

- A. Testing and inspection services to meet the requirements of the California Building Code (CBC).
- B. Related Requirements:
  - 1. Section 03 30 00 – Cast-in-Place Concrete.
  - 2. Section 04 20 00 – Concrete Unit Masonry.
  - 3. Section 05 12 00 – Structural Steel Framing.
  - 4. Section 05 50 00 - Metal Fabrications.
  - 5. Section 06 10 00 – Rough Carpentry.
  - 6. Section 07 84 00 - Fire Stopping.
  - 7. Section 31
  - 8. Structural Drawings.

**1.03 REFERENCES**

- A. American Concrete Institute (ACI):
  - 1. ACI 318 – Building Code Requirements for Structural Concrete and Commentary.
- B. American Institute of Steel Construction (AISC):
  - 1. AISC 360 – Specification for Structural Steel Buildings.
  - 2. AISC 341 – Seismic Provisions for Structural Steel Buildings.
- C. ASTM International (ASTM):
  - 1. ASTM A108 – Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
  - 2. ASTM A370 – Standard Test Methods and Definitions for Mechanical Testing of Steel Products.
  - 3. ASTM A706 – Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement.
  - 4. ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
  - 5. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.
  - 6. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
  - 7. ASTM C1314 - Standard Test Method for Compressive Strength of Masonry Prisms.
  - 8. ASTM E164 - Standard Practice for Contact Ultrasonic Testing of Weldments.
  - 9. ASTM E488 - Standard Test Methods for Strength of Anchors in Concrete Elements.
  - 10. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing.

11. ASTM E605 - Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members.
12. ASTM E1444 - Standard Practice for Magnetic Particle Testing.
13. ASTM F606 - Standard Test Methods for Determining the Mechanical Properties of Externally and Internally Threaded Fasteners, Washers, Direct Tension Indicators, and Rivets.
- D. Association of the Wall and Ceiling Industry (AWCI):
  1. AWCI Technical Manual 12-B - Standard Practice for the Testing and Inspection of Field Applied Thin Film Intumescent Fire-Resistive Materials; an Annotated Guide.
- E. American Welding Society (AWS):
  1. AWS D1.1 – Structural Welding Code.
  2. AWS D1.4 – Structural Welding Code – Reinforcing Steel.
  3. AWS D1.8 – Structural Welding Code – Seismic Supplement.

#### **1.04 REGULATORY REQUIREMENTS**

- A. Laboratories performing testing shall have City's Laboratory Evaluation and Acceptance Program approval prior to providing material testing or special inspection services.
- B. Tests of materials and inspections shall be in accordance to Section 4-213 through 4-219 of the California Building Standards Commission's, California Administrative Code.

#### **1.05 TESTS**

- A. Owner will contract with a City approved testing laboratory to perform the testing indicated on the Contract Documents, including the Tests and Special Inspections (T&I) list.
- B. Selection of material to be tested shall be by the Testing Laboratory and not by Contractor.
- C. Any material shipped from the source of supply prior to having satisfactorily passed such testing and inspection, or prior to the receipt of notice from Project Inspector such testing and inspection is not required, shall not be incorporated into the Work.
- D. The Testing Laboratory is not authorized to release, revoke, alter, or enlarge requirements of the Contract Documents or approve or accept any portion of the Work.
- E. The Testing Laboratory shall not perform any duties of Contractor.
- F. Contractor shall provide an insulated curing box with the capacity for twenty concrete cylinders and will relocate said box and cylinders as rapidly as required in order to provide for progress of the Work.

#### **1.06 TEST REPORTS**

- A. Test reports shall include all tests performed, regardless of whether such tests indicate the material is satisfactory or unsatisfactory. Samples taken but not tested shall also be reported. Records of special sampling operations, when and as required, shall also be reported. Reports shall indicate the material (or materials) was sampled and tested in accordance with requirements of CBC, Title 24, Parts 1 and 2, as indicated on the Contract Documents. Test reports shall indicate specified design strength and specifically state whether or not the material (or materials) tested comply with the specified requirements.

#### **1.07 VERIFICATION OF TEST REPORTS**

- A. Each Testing Laboratory shall submit to the City, in duplicate, a verified report covering all tests required to be performed by that agency during the progress of the Work. Such report, covering all required tests, shall be furnished prior to Substantial Completion and/or, when construction on the Work is suspended, covering all tests up to the time of Work suspension.

**1.08 INSPECTION BY OWNER**

- A. Owner, and its representatives, shall have access, for purposes of inspection, at all times to all parts of the Work and to all shops wherein the Work is in preparation. Contractor shall, at all times, maintain proper facilities and provide safe access for such inspection.
- B. OAR shall have the right to reject materials and/or workmanship deemed defective Work and to require correction. Defective workmanship shall be corrected in a satisfactory manner and defective materials shall be removed from the premises and legally disposed of without charge to Owner. If Contractor does not correct such defective Work within a reasonable time, fixed by written notice and in accordance with the terms and conditions of the Contract Documents, Owner may correct such defective Work and proceed in accordance with related Articles of the Contract Documents.
- C. Contractor is responsible for compliance to all applicable local, state, and federal regulations regarding codes, regulations, ordinances, restrictions, and requirements.

**1.09 PROJECT INSPECTOR**

- A. A Project Inspector will be employed by Owner in accordance with requirements of Title 24 of the California Code of Regulations with their duties specifically defined therein.
- B. Inspection of Work shall not relieve Contractor from any obligation to fulfill all terms and conditions of the Contract Documents.
- C. Contractor shall be responsible for scheduling times of inspection, tests, sample taking, and similar activities of the Work.

**1.10 STRUCTURAL TESTS AND SPECIAL INSPECTIONS**

- A. Soils:
  - 1. General: Periodic inspection by Geotechnical Engineer for verification of the following construction activities in conformance to CBC Table 1705A.6:
    - a. Site has been prepared properly prior to placement of controlled fill and/or excavations for foundations.
    - b. Foundation excavations are extended to proper depth and have reached proper material.
    - c. Materials below footings are adequate to achieve the design bearing capacity.
  - 2. Compacted Fills: Testing and inspections shall be in conformance to Table 1705A.6:
    - a. Geotechnical Engineer will continuously verify the use of proper materials and inspect lift thicknesses, placement, and compaction during placement of fill.
    - b. Testing Laboratory under the supervision of the Geotechnical Engineer will:
      - 1) Perform qualification testing of fill materials.
      - 2) Test the compaction of fill.
  - 3. Retaining Walls:
    - a. Continuous inspections by Geotechnical Engineer:
      - 1) Placement, compaction and inspection of soil per CBC Section 1705A.6.1 for fills supporting foundations.
      - 2) Segmental retaining walls; inspect placement of units, dowels, connectors, etc.
    - b. Concrete Retaining Walls: Provide tests and inspections as indicated on paragraphs below for concrete.
    - c. Masonry Retaining Walls: Provide tests and inspections as indicated on paragraphs below for masonry.
- B. Concrete:
  - 1. Cast in Place Concrete: Inspection and testing in conformance to CBC Table 1705A.3:

- a. Inspection of reinforcement, including prestressing tendons and verification of placement, per ACI 318, sections 25.2, 25.2, 25.5.1 through 26.5.3.
- b. Reinforcing bar welding: Inspect per AWS D1.4, ACI 318 26.5.4.
  - 1) Verification of weldability of reinforcing bars other than ASTM A706.
  - 2) Inspect single-pass fillet welds, maximum 5/16".
  - 3) Inspect all other welds.
- c. Inspect anchors cast in concrete per ACI 318, section 17.8.2.
- d. Inspect anchors post-installed in hardened concrete members:
  - 1) Continuous inspection of adhesive anchors installed in horizontally or upwardly inclined orientations to resist sustained tension loads, per ACI 318, section 17.8.2.4.
  - 2) Mechanical anchors and adhesive anchors, not defined in previous paragraph, per ACI 318, section 17.8.2.
- e. Design Mix:
  - 1) Verify use of required mix, per ACI 318, chapter 19 and sections 26.4.3 and 26.4.4.
  - 2) Batch Plant Inspection: The quality and quantity of materials used in transit-mixed concrete and in batched aggregates shall be continuously inspected as required by CBC section 1705A.3.2. If approved by City, batch plant inspection may be reduced to periodic if plant complies with CBC section 1705A3.3.1, item 1, and requires first batch inspection, weightmaster, and batch tickets.
- f. Prior to concrete placement, fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete, per ASTM C172, ASTM C31, ACI 318, sections 26.4.5 and 26.12.
- g. Inspect concrete placement for proper application techniques, per ACI 318, section 26.4.5.
- h. Verify maintenance of specified curing temperature and techniques per ACI 318 sections 26.4.7 through 26.4.9 and CBC section 1908.9.
- i. Inspect prestressed concrete for:
  - 1) Application of prestressing forces, per ACI 318 section 26.9.2.1
  - 2) Grouting of bonded prestressing tendons per ACI 318 section 26.9.2.3.
- j. Inspection of erection of precast concrete members per ACI 318 chapter 26.8.
- k. Verify in-situ concrete strength, prior to stressing of tendons in post-tensioned concrete and prior to removal of shores and forms from beams and structural slabs per ACI 318 section 26.10.1.b.
- l. Sampling and testing of reinforcing steel per ASTM A370, CBC section 1910A.2. Contractor shall submit mill certificate indicating compliance with requirements for reinforcement, anchors, ties, and metal accessories.
2. Prestressed Concrete: In addition to the tests and inspections required for concrete listed above, the following tests and inspections will performed:
  - a. Testing Laboratory will test prestressing tendons and anchorages per CBC section 1910A.3 and ASTM A370.
  - b. Special Inspector will check the materials, equipment, tensioning procedure and inspect placement of prestressing tendons and construction, per CBC section 1705A.3.4.
  - c. Special Inspector will verify in-situ adequate concrete strength prior to stressing tendons.



- d. Continuous inspection by Special Inspector of application of prestressing forces and grouting of bonded prestressing tendons, per CBC section 1705A.3.4.
- 3. Precast Concrete: In addition to the tests and inspections required for concrete listed above, the following tests and inspections will performed:
  - a. Continuous inspection by Special Inspector of fabrication of precast concrete members.
  - b. Inspection of erection of precast concrete members per ACI 318, chapter 26.8.
- 4. Post-installed Anchors:
  - a. Special Inspector will inspect installation of post-installed anchors in hardened concrete members as required by CBC table 1705A.3, item 4.
    - 1) Adhesive anchors installed in horizontally or upwardly inclined orientations to resist sustained tension loads, per ACI 318, section 17.8.2.4.
    - 2) Mechanical anchors and adhesive anchors not defined above, per ACI 318, section 17.8.2.
  - b. Testing Laboratory will test post-installed anchors in conformance to CBC section 1905A and ASTM E488.
- C. Structural Masonry:
  - 1. Material Verification and Testing:
    - a. Sampling and testing of reinforcing steel per ASTM A370, CBC section 1910A.2. Contractor shall submit mill certificate indicating compliance with requirements for reinforcement, anchors, ties, and metal accessories.
    - b. Submit manufacturer's certificate of compliance for masonry units, mortar and grout materials. Test masonry units, mortar and grout (unit strength method).
    - c. Testing Laboratory will test masonry prisms in conformance with ASTM C1314.
    - d. Special Inspector will verify proportions of site-prepared, premixed or preblended mortar and grout, per ASTM C780.
    - e. Testing Laboratory will test core-drilled samples in conformance with CBC 2114.6.2.
  - 2. Inspection:
    - a. Special Inspector will continuously inspect preparation of prisms per ASTM C1314.
    - b. Special inspector will verify size, location and condition of dowels and construction supporting masonry.
    - c. Special inspector will verify size specified size, grade and type of reinforcement.
    - d. Special inspector will verify weldability of reinforcing bars other than ASTM A706. Special inspector to inspect reinforcing bar welding: Inspection to be in conformance with AWS D1.4, ACI 318 26.5.4.
    - e. Special inspector will inspect placement of reinforcement, connectors, masonry units and construction of mortar joints.
    - f. Special inspector will verify protection of masonry during cold weather temperature (temperature below 40o F) or hot weather (temperature above 90o F).
    - g. Special inspector will inspect type, size and location of anchors and all other items to be embedded in masonry, including other details of anchorage of masonry to structural members, frames and other construction.
    - h. Special inspector will inspect grout space prior to grouting and placement of grout.
  - 3. Post-installed Anchors in Masonry:
    - a. Special inspector will inspect anchors cast in concrete per ACI 318, section 17.8.2.
    - b. Special inspector will inspect anchors post-installed in hardened concrete members:



- 1) Continuous inspection of adhesive anchors installed in horizontally or upwardly inclined orientations to resist sustained tension loads, per ACI 318, section 17.8.2.4.
  - 2) Mechanical anchors and adhesive anchors, not defined in previous paragraph, per ACI 318, section 17.8.2.
  - c. Testing Laboratory will test post-installed anchors in conformance to CBC section 1905A and ASTM E488.
- D. Structural Steel:
1. Special inspector will verify that all materials are properly marked in conformance with AISC 360, Section 3.3 and applicable ASTM standards.
    - a. Mill certificates indicating material properties that comply with requirements.
    - b. Materials, sizes, types and grades complying with requirements.
  2. Testing Laboratory will test unidentified materials in conformance with ASTM A370.
  3. Special inspector will examine seam welds of HSS shapes in conformance with ASTM.
  4. Special inspections and non-destructive testing of structural steel elements shall be in conformance to CBC section 1705A.2.1.
- E. High Strength Bolts:
1. Special inspector will verify identification markings and manufacturer's certificates of compliance conform to ASTM standards specified in the Contract Documents, per ASTM.
  2. Testing Laboratory will test high-strength bolts, nuts and washers in conformance with ASTM F606, ASTM A370.
  3. Special inspector will inspect bearing-type ("snug tight") bolt connections in conformance with AISC 360, section M2.5.
  4. Special inspector will inspect slip-critical bolt connections in conformance with AISC 360, section M2.5.
- F. Welding:
1. Verification of Materials, Equipment and Welders:
    - a. Special inspector will verify weld filler material identification markings per AWS designation listed on the Contract Documents and the WPS.
    - b. Special inspector will verify material manufacturer's certificate of compliance.
    - c. Special inspector will verify WPS, welder qualifications and equipment in conformance to CBC.
  2. Shop Welding: Special inspector will inspect the following, per CBC 1705A.2.1, AISC 360 (and AISC 341, as applicable).
    - a. Groove, multi-pass fillet welds larger than 5/16", plug and slot welds.
    - b. Single-pass fillet welds equal or less than 5/16".
    - c. Inspect welding of stairs and railing systems.
    - d. Verification of reinforcing steel weldability.
    - e. Welding of reinforcing steel, per AWS D1.4.
  3. Field Welding: Special inspector will inspect the following, per CBC 1705A.2.1, AISC 360 (and AISC 341, as applicable):
    - a. Groove, multi-pass fillet welds larger than 5/16", plug and slot welds.
    - b. Single-pass fillet welds equal or less than 5/16".
    - c. End welded studs (((ASTM A108))) installation, including bend test.
    - d. Floor and roof deck welds.
    - e. Welding of structural cold-formed steel.
    - f. Welding of stairs and railing systems.

- g. Verification of reinforcing steel weldability.
- h. Inspect welding of reinforcing steel.
- 4. Non-Destructive Testing: Testing Laboratory will test perform ultrasonic and magnetic particle testing in conformance to AISC 360 section N5.5, AISC 341 appendix Q5.2, AWS D1.1, AWS D1.8, ASTM E543, ASTM E1444, ASTM E164.
- G. Steel Joists and Trusses: Continuous inspection, special inspector will verify size, type and grade for all chord and web members as well as connectors and weld filler material, verify joist profile, dimensions and chamber (if applicable); verify all weld locations, lengths and profiles; mark or tag each joist, in conformance with CBC section 2207.1.
- H. Fire-Proofing:
  - 1. Spray Applied:
    - a. Project inspector will examine structural steel surface conditions, inspect application, take samples, measure thickness, and verify compliance of all aspects of application with Construction Documents, in conformance with CBC sections and ASTM E.605.
    - b. Testing Laboratory will test bond strength in conformance with ASTM E605, per CBC section 1705A.14.6.
    - c. Testing Laboratory will test density in accordance with ASTM E605, per CBC section 1705A.14.5.
  - 2. Intumescent Fire-Resistant Coatings: Special inspector will inspect and test in accordance with AWCI 12-B, per CBC section 1705A.15.
- I. Anchor Bolts, Anchor Rods and Other Steel:
  - 1. Testing Laboratory will sample and test not readily identifiable anchor bolts and anchor rods in accordance with CBC.
  - 2. Testing Laboratory will sample and test not readily identifiable threaded rod not used for foundation anchorage per procedures noted in CBC.
- J. Prefabricated Wood Structural Elements:
  - 1. Special inspector will continuously inspect fabrication of glued-laminated timber in accordance with CBC section 1704A2.5.
  - 2. Special inspector will continuously inspect fabrication of manufactured open-web trusses in accordance with CBC 1704A2.5.
  - 3. Special inspector will continuously inspect fabrication of manufactured metal plate connected trusses in accordance with CBC 1704A2.5.

**PART 2 – PRODUCTS (NOT USED).**

**PART 3 – EXECUTION (NOT USED).**

**END OF SECTION**

**SECTION 01 50 00**  
**TEMPORARY FACILITIES AND CONTROLS**

**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. Temporary Utilities.
- B. Temporary Field Offices.
- C. Telecommunications Services.
- D. Temporary Sanitary Facilities.
- E. Temporary Security Fencing and Barriers.
- F. Other Temporary Enclosures and Barricades.
- G. Interior Enclosures.
- H. Security Requirements.
- I. Temporary Protection Facilities Installation
- J. Vehicular access and parking.
- K. Waste Removal.
- L. Removal of Utilities, Facilities, and Controls.
- M. Trenches.
- N. Dust Control.
- O. Wash Out.
- P. Adverse Weather Conditions.
- Q. Directional Signage and Required Postings.

**1.02 QUALITY ASSURANCE**

- A. Contractor shall comply with applicable laws and regulations of authorities having jurisdiction, including, but not limited to, the following:
  - 1. Building Code requirements.
  - 2. Health and safety regulations.
  - 3. Utility company regulations.
  - 4. Police, fire department, and rescue squad requirements.
  - 5. Environmental protection regulations.
- B. Contractor shall arrange for the inspection and testing of each temporary utility prior to use. Obtain required certifications and permits, and then transmit them to OAR.

**1.03 SUBMITTALS**

- A. Temporary Utilities: Submit to OAR reports of tests, inspections, meter readings, certifications, permits, and similar procedures performed on temporary utilities.

**1.04 TEMPORARY UTILITIES**

- A. Owner will provide the following:
  - 1. Electrical power and metering, consisting of connection to existing facilities.
  - 2. Water supply, consisting of connection to existing facilities.
- B. Owner shall pay for all electrical power and water that is required for construction purposes.
- C. Contractor shall furnish, install, and remove all temporary power equipment, lighting, and water connections as needed to perform the Work.
- D. If for any reason the utilities are shutdown by Contractor or Utility Companies, Contractor shall provide, at its expense, temporary means to keep the Work progressing, included, but not limited to generators, water tanks, waste tanks, etc.
- E. Contractor shall implement water and energy saving measures during construction, including but not limited to:



**SECTION 01 50 00  
TEMPORARY FACILITIES  
AND CONTROLS**

**DIVISION 01**

1. Use trigger-operated nozzles for water hoses to avoid water waste.
  2. Repair leaks, drips, and defective connections immediately.
  3. Shutting off lighting and electrical equipment when not in active use.
  4. Utilizing energy-efficient temporary lighting and equipment where feasible.
  5. Coordinating work to reduce unnecessary run-time of high-demand equipment.
- F. Contractor shall:
1. Coordinate with the appropriate utility company to install temporary services, as required for construction. Where the utility company provides only partial service, Contractor shall provide and install the remainder with matching compatible materials and equipment.
  2. Provide, fuel, operate, and maintain temporary generators when required for construction sequencing, outages, or emergency backup.
  3. Pay all costs for labor, equipment, fuel, maintenance, and removal of temporary power installations and generators.
  4. Upon Substantial Completion of the Work, remove temporary systems, devices and appurtenances.
- G. Continuity of Utilities:
1. The Contractor shall maintain continuous operation of existing utilities and systems serving the site unless shutdowns are approved in advance by the Owner.
  2. If any utility or service is interrupted or shut down, whether by the Contractor's actions, utility company work, or other causes, the Contractor shall, at its sole expense, provide temporary means and equipment necessary to maintain the progress of the Work and required services.
  3. Temporary systems may include, but are not limited to, generators, portable water tanks, waste holding tanks, and temporary connections or bypasses.
  4. Temporary systems shall be safe, code-compliant, and sufficient to support all affected construction activities.
  5. Any resulting delay shall not be grounds for time extension or additional compensation.
  6. The Contractor shall coordinate all utility interruptions with the Owner and provide a minimum of **72 hours' written notice** prior to any planned shutdown.

**1.05 TEMPORARY FIELD OFFICES**

- A. Field office may be located on-site in temporary structures provided by Contractor, or in designated portions of existing facilities, if approved by Owner.
- B. Contractor may use designated areas of the existing facility for temporary offices, storage, and crew support, subject to the following:
  1. Location and extent of use shall be approved in writing by Owner prior to occupancy.
  2. Contractor may use existing furniture, subject to approval by Owner prior to use.

**1.06 TELECOMMUNICATIONS SERVICES**

- A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.
- B. Telecommunications services shall include:
  1. Internet Connections: Minimum of one; DSL modem or faster.

**1.07 TEMPORARY SANITARY FACILITIES**

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
- B. Contractor shall pay for all temporary sanitary facilities, as required.
- C. Use of existing facilities at Project Site is permitted.
- D. Maintain daily in clean and sanitary condition.



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- E. At end of construction, return facilities to same or better condition as originally found.

**1.08 TEMPORARY SECURITY FENCING AND BARRIERS**

- A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Provide barricades and covered walkways required by governing authorities for public rights-of-way.
- C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.
- D. Contractor will provide a 6-foot-high fence around the construction site, equipped with a lockable vehicular gate. Contractor shall maintain fence and gate in good condition for the duration of the Work, including repairs, replacements, and adjustments as required.
- E. At Contractor's expense and without limitation, remove or relocate fencing, fabric, and barricades or other security and protection facilities as rapidly as required in order to provide for progress of the Work.

**1.09 OTHER TEMPORARY ENCLOSURES AND BARRICADES**

- A. Provide temporary insulated weather-tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.
- B. Provide lockable, temporary weather-tight enclosures at openings in exterior walls to create acceptable working conditions, to allow for temporary heating, and for security.
- C. Provide protective barriers around trees, plants and other improvements designated to remain. Replace damaged plants.
- D. Since the Work of this Project may be immediately adjacent vehicular and pedestrian right of ways, Contractor shall, in his sole judgment and in accordance with applicable safety standards, provide temporary facilities, additional barricades, protection and care to protect existing structures, occupants, property, pedestrians and vehicular traffic. Contractor is responsible for any damage that may occur to the property and occupants of the property of Owner or adjacent private or public properties, which in any way results from the acts or neglect of Contractor.
- E. Contractor shall be responsible for cleaning up all areas adjacent to the construction site which have been affected by the construction; and for restoring them to at least their original condition- including landscaping; planting of trees, and shrubs damaged by construction; and raking and disposal of debris such as roofing shingles, paper, nails, glass sheet metal, bricks, and waste concrete. Construction debris shall be removed and properly disposed of. Culverts and drainage ditches with sediment from the construction area shall be cleared routinely to maintain proper drainage and re-cleaned prior to completion of the contract.
- F. Contractor shall ensure sediment does not block storm drains. Contractor shall be responsible for cleaning storm drains blocked due to erosion or sediment from the work area.

**1.10 INTERIOR ENCLOSURES**

- A. Provide temporary partitions and ceilings as indicated to separate work areas from Owner-occupied areas, to prevent penetration of dust and moisture into Owner-occupied areas, and to prevent damage to existing materials and equipment.



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**1.11 PROTECTION OF EXISTING FURNISHINGS AND MATERIALS**

- A. Contractor shall protect existing and new furniture and materials within and adjacent to the Work area. Acceptable protection includes 6-mil polyethylene sheeting, corrugated cardboard, plywood, or padded blankets, secured with corner guards and non-marring fasteners.
- B. Contractor may dismantle bookshelves or similar furnishings as required for storage and transport. Contractor may place large furnishings on temporary casters or dollies for relocation, subject to Owner approval. Provide protective underlayment beneath casters at all times to prevent damage to floor finishes. Secure furnishings to prevent tipping or uncontrolled movement.
- C. All dismantled or relocated furniture must be reassembled to its original state and relocated to its original location by the Contractor. Contractor to photograph and inventory the condition and location prior.
- D. Coordinate with Owner to designate storage and staging areas. Maintain coverings in good condition and replace if damaged. Handle and store furnishings to prevent impact, stress, or distortion. Do not stack or store items in a manner that could cause damage.
- E. Repair or replace, at no cost to Owner, any furnishings or materials damaged during construction.
- F. Upon project completion, Contractor shall clean and return all items to original condition and location specified by OAR.

**1.12 SECURITY REQUIREMENTS**

- A. Security of the Project site and contents is a continuous obligation of the Contractor.
- B. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.
- C. Coordinate with Owner's security program.
- D. Contractor shall employ and maintain sufficient security and safety measures to effectively prevent vandalism, vagrancy, theft, arson, and all other such negative impacts to the Work. Any impacts to the progress of the Work of Contractor, Owner, or Owner's forces, due to loss from inadequate security, will be the responsibility of Contractor.
- E. Contractor shall provide, install and maintain substantial temporary enclosures of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft and similar violations of security. Where materials, tools and equipment are stored within the Work area, Contractor shall provide secure lock up to protect against vandalism, theft and similar violations of security. Owner accepts no financial responsibility for loss, damage, vandalism or theft.
- F. Until Substantial Completion of the Work, Contractor shall employ appropriate means to remove all graffiti from buildings, equipment, fences, and all other temporary and/or permanent improvements on the Project site within twenty-four (24) hours from the date of report or forty-eight (48) hours of each occurrence.

**1.13 TEMPORARY PROTECTION FACILITIES INSTALLATION**

- A. Contractor shall not change over from using temporary facilities and controls to permanent facilities until Substantial Completion, except as permitted by OAR.
- B. Until permanent fire protection needs are supplied and approved by AHJ, Contractor shall provide, install, and maintain temporary fire protection facilities of the types needed in order to adequately protect against fire loss. Contractor shall adequately supervise welding operations, combustion type temporary heating and similar sources of fire ignition.



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- C. Contractor operations shall not block, hinder, impede or otherwise inhibit the use of required exits and/or emergency exits to the public way, except as approved by OAR. Contractor shall maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways and other access routes for firefighting equipment and/or personnel.
- D. With approval of OAR and at the earliest feasible date in each area of the Work, complete installation of the permanent fire protection facilities including connected services and place into operation and use. Instruct Owner personnel in use of permanent fire protection facilities.
- E. In the event of an emergency drill or an actual emergency, designated by the sounding of the fire alarm and/or other sounding device, all construction activities must cease. Contractor shall evacuate the Work area and remain outside the Work area until permitted to return. No Work shall be conducted during the evacuation of a building or during an emergency.
- F. Portable fire extinguishers are required on the project site at all times during construction.

**1.14 VEHICULAR ACCESS AND PARKING**

- A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.
- B. Coordinate access and haul routes with governing authorities and Owner.
- C. Provide and maintain access to fire hydrants, free of obstructions.
- D. Provide means of removing mud from vehicle wheels before entering streets.
- E. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

**1.15 WASTE REMOVAL**

- A. See Section 017419 - Construction Waste Management and Disposal and 01 81 13 "Sustainable Design Requirements", for additional requirements.
- B. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- C. Provide containers with lids. Remove trash from site periodically.
- D. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.
- E. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

**1.16 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS**

- A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.
- B. Remove underground installations to a minimum depth of 2 feet (600 mm). Grade site as indicated.
- C. Clean and repair damage caused by installation or use of temporary work.
- D. Restore existing facilities used during construction to original condition.





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**1.17 TRENCHES**

- A. Open trenches for installation of utility lines (water, gas, electrical and similar utilities) and open pits outside barricaded working areas shall be barricaded at all times in a legal manner determined by Contractor. Trenches shall be backfilled and patch-paved within twenty-four (24) hours after approval of installation by authorities having jurisdiction or shall have "trench plates" installed. Required access to buildings shall be provided and maintained. Contractor shall comply with all applicable statutes, codes and regulations regarding trenching and trenching operations. Open trenches deeper than 3'-6", and not located within a public street access, shall be enclosed within an 8'-0" high chain-link fence.

**1.18 DUST CONTROL**

- A. Contractor is responsible for dust control on and off the Project site. When Work operations produce dust the Project site and/or streets shall be sprinkled with water to minimize the generation of dust. Contractor shall clean all soils and debris from construction vehicles and cover both earth and debris loads prior to leaving the Project site. Contractor shall, on a daily basis, clean all streets and/or public improvements within the right of way of any and all debris, dirt, mud and/or other materials attributable to operations of Contractor.

**1.19 WASH OUT**

- A. Contractor shall provide wash out boxes of sufficient size and strength as required to provide for concrete mixer wash out. Contractor shall locate and relocate both the wash out boxes and wash out areas in order to accommodate the progression of the Work. The wash out area shall be located as to minimize the amount of potential run off onto adjacent private and/or public property. Contractor shall legally dispose of the contents of the wash out boxes and area on an as needed basis or as required by OAR.

**1.20 ADVERSE WEATHER CONDITIONS**

- A. Should warnings of adverse weather conditions such as heavy rain and/or high winds be forecasted, Contractor shall provide every practical precaution to prevent damage to the Work, Project site, and adjacent property. Contractor precautions shall include, but not be limited to, enclosing all openings, removing and/or securing loose materials, tools, equipment and scaffolding.
- B. Contractor shall provide and maintain drainage away from buildings and structures.
- C. Contractor shall implement all required storm water mitigation measures as required under related Division 01 Sections.

**1.21 DIRECTIONAL SIGNAGE AND REQUIRED POSTINGS**

- A. Contractor shall provide, install, and maintain signage for directional, identification, safety, and compliance purposes, subject to review by the OAR. Signage shall include, but not be limited to, the following:
  - 1. For construction traffic control/flow at entrances/exits, and as designated by OAR.
  - 2. Visitor and delivery directions.
  - 3. For construction parking.
  - 4. Warning and hazard signs as required.
  - 5. CAL/OSHA safety signage.
  - 6. Trailer identification and the Project site address.
  - 7. "No Smoking" postings at designated locations.
  - 8. Emergency contact information and phone number of Contractor.





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9. Emergency contact information and phone number of local police, fire, and emergency personnel.
  10. Authorized labor law posters as required by federal and state agencies (e.g., Department of Labor), made available to all workers.
  11. Construction Waste Management Procedures in conformance with CalGreen. Refer to A050 through A054 and Specification Section 01 81 13 "Sustainable Design Requirements" for additional information.
  12. Indoor Air Quality Management Plan in conformance with CalGreen. Refer to A050 through A054 and Specification Section 01 81 13 "Sustainable Design Requirements" for additional information.
- B. Prevailing wage notices or determinations (pay rates, fringe benefit requirements) as mandated for public works projects.
1. If benefit payments are directed to a trust fund, include an appropriate statement of such payment requirement.
  2. Any other signage required by law, regulation, Owner, or as necessary for the safe and orderly conduct of the Work.
- C. Contractor shall keep all signage and postings legible, current, and weather-protected throughout the duration of the Work. Damaged or outdated signs shall be replaced promptly.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

**END OF SECTION**

**SECTION 01 55 26**  
**TRAFFIC CONTROL AND ACCESS**

**PART 1 - GENERAL**

**1.01 GENERAL**

- A. The Contractor shall provide traffic control and access in accordance with these Specifications, Caltrans Standard Specifications and Plans, and the standards contained in the "Work Area Traffic Control Handbook" (WATCH) published by Building News, Inc. The Contractor shall take all necessary precautions for the protection of the Work and the safety of the public. All barricades and obstructions shall be illuminated at night, and all lights shall be kept burning from sunset until sunrise. The Contractor shall prepare and submit Traffic Control plans and comply with special safety regulations relating to traffic control as may be required by the County of Santa Barbara or other public authorities within their respective jurisdiction.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION**

**3.01 EQUIPMENT TRAVEL ROUTE**

- A. The Contractor shall make its own investigation of the condition of available access routes to and from the work site. If suitable access is not available, it shall be the Contractor's responsibility to construct and maintain any access or haul roads required for its construction operations. The travel route for the Contractor's equipment shall follow the safest route possible and minimize inconvenience to motorists and pedestrians.

**3.02 TEMPORARY STREET USE**

- A. Nothing herein shall be construed to entitle the Contractor to the exclusive use of any public street, alley, way, or parking area during the performance of the Work hereunder. The Contractor shall conduct its operations as not to interfere unnecessarily with the authorized work of the City, utility companies, or other agencies in such streets, alleys, ways, or parking areas.
- B. No street shall be closed to the public without first obtaining the permission of the County of Santa Barbara, the City of Goleta, and other proper governmental authority, where applicable. Where excavation is being performed in primary streets or highways, at least one lane of traffic shall be kept open in each direction at all times unless otherwise provided in the Contract Documents or under the terms of the permits issued by the County of Santa Barbara, State, District or other public agencies and Authority Having Jurisdiction, as required.
- C. Toe boards shall be provided to restrict the movement of excavated material if required by the County, the City of Goleta, or other agency having jurisdiction over the affected street or highway. The Contractor shall make temporary provisions to assure the use of sidewalks and the proper functioning of all gutters, drainage inlets, and other drainage facilities.

**3.03 TRAFFIC CONTROL**

- A. For the protection of traffic in public or private streets and ways, the Contractor shall provide, place, and maintain all necessary barricades, traffic cones, warning signs, lights, and other safety devices in accordance with the requirements of Caltrans "Manual of Traffic Controls - Warning Signs, Lights, and Devices for Use in Performance of Work Upon Highways."

- B. Provide, place and maintain all necessary barricades, traffic cones, warning signs, lights and other safety devices. Post and maintain adequate detour signs at all applicable approaches to forewarn and direct traffic. Use illuminated and/or reflective warning/construction signs at appropriate locations for the project. Use solar powered flashing arrow boards for each lane closure taper in addition to other delineation. Provide safe and effective work areas and warn, control, protect and expedite vehicular and pedestrian traffic through the construction project.
- C. Provide temporary traffic re-striping at the conclusion of any working day for any centerline or lane line which is obliterated by construction. Use temporary asphalt surfacing at the Contractor's own expense as required to maintain traffic in a safe and non-disruptive manner. Provide temporary delineation as required which includes sandblasting of conflicting markings, installation and removal of temporary centerlines or lane lines, detour signing, barricading, and replacement of traffic lines, and markings in their proper locations upon termination of the detour. Provide any temporary pavement marking. Provide for removal of existing markings and the later removal of temporary markings to restore the permanent markings.
- D. Through traffic shall be maintained in both directions during working hours. Reopen all traffic lanes for the traffic circulation at the end of each working day, and during non-working hours including holidays, Saturdays, and Sundays. Provide traffic re-striping and markings prior to opening street traffic.
- E. Where required, the Contractor shall furnish, install, and maintain in-place "No Parking – Tow Away" signs (even if streets have posted "No Parking" signs) which shall be posted at least two (2) working days prior to commencement of work. On the sign, Contractor shall print the hours, day(s) and date of closure in two-inch-high letters and numbers. The signs shall be spaced at a maximum of 50 feet (1524 cm) from street intersection and/or from each adjacent sign.
- F. The Contractor shall be responsible for the project safety on a 24-hours basis each calendar day for the entire duration of the project.

#### **3.04 ACCESS**

- A. Wherever necessary or required for the convenience of the public or individual residents or business places at street or highway crossings, private driveways, or elsewhere, the Contractor shall provide suitable temporary bridges or steel plates over unfilled excavations, except in such cases as the Contractor shall secure the written consent of the individuals or authorities concerned to omit such temporary bridges or steel plates. Such written consent shall be delivered to the City of Goleta prior to beginning the excavation. All such bridges or steel plates shall be maintained in service until access is provided across the backfilled excavation.
- B. Temporary bridges or steel plates for street and highway crossings shall conform to the requirements of the City of Goleta, County of Santa Barbara, Caltrans or the authority having jurisdiction in each case. The Contractor shall adopt designs furnished by said authority for such bridges or steel plates, or shall submit designs to said authority for approval, as may be required.
- C. Maintain adjacent streets open for ingress and egress and for parking; Provide emergency access for fire trucks, police cars, and other emergency vehicles at all times. The Contractor shall notify each agency in writing at least three (3) working days prior to work, and submit a copy of the notice to the City of Goleta. Fire hydrants on or adjacent to the work shall be kept accessible to fire-fighting equipment at all times.



**SECTION 01 55 26  
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- D. Construct temporary AC ramps to provide safe and drivable access to residents and businesses and safe pedestrian crossing paths at all times. Provide alternate crossing areas with appropriate signing and other devices where construction prohibits pedestrian and bicycle access. Provide safe and adequate pedestrian zones and public transportation stops, as well as reasonable pedestrian crossings of the work at frequent intervals. Notify local/regional transit agency of potential impact to bus routes and interference with bus stops. There may be a need for temporary bus stop relocations if required. Keep the areas through and adjacent to the construction site clear of any objects that may be hazardous to pedestrians.

**3.05 WORKING HOURS**

- A. Construction work operations shall be performed Monday through Friday except City observed holidays unless otherwise noted. The Contractor work hours shall be at City discretion Monday through Friday except that work within the street right-of-way that effects the flow of traffic shall only be allowed in accordance with the issued encroachment permit.

**3.06 NOTIFICATION**

- A. The Contractor shall provide notification in writing to affected residences, schools, churches, and businesses informing them of the pending project. A draft notification letter shall be submitted to the City of Goleta five (5) working days in advance of required notification date for verification and approval. The Contractor shall hand deliver copies of the approved notification letter to the affected residences, school, churches, and businesses at least fourteen (14) days prior to the scheduled construction on each block. The notification letter shall state the project name, scope of work, date and time of restricted travel on the affected streets, and the Contractor's and City's contact persons and phone numbers. -Failure to meet the approved schedule requires that the Contractor immediately notify residents of the cancellation for that day's work and reschedule construction of the affected area at a later date. Notification of rescheduled work shall follow this same procedure.

**3.07 TRAFFIC CONTROL PLANS**

- A. Traffic control plans shall be provided by the Contractor and submitted to the City, County of Santa Barbara, Caltrans, or other agencies having jurisdiction as may be required. Traffic control plans shall conform to the requirements of the City of Goleta, County of Santa Barbara, or Caltrans as applicable, and shall include the location and wording of all signs, barricades, delineators, lights, warning devices, and temporary parking restrictions; a separate plan for each stage of construction; and a separate detour routing plan.

**3.08 TEMPORARY STREET CLOSURE**

- A. If closure of any street is required during construction, a formal application for a street closure shall be made to the City of Goleta or other authority having jurisdiction at least thirty (30) days prior to the required street closure to allow them to determine the necessary signing and detour requirements to be provided by the Contractor.

**END OF SECTION**

**SECTION 01 57 23  
TEMPORARY STORM WATER POLLUTION CONTROL**

**PART 1 - GENERAL**

**1.1 PERFORMANCE**

**A. Minimum Water Quality Protection Requirements**

1. The Contractor is required to meet the following minimum standards of good housekeeping:
  - a. Eroded sediments and other pollutants must be retained on site and may not be transported from the site via sheetflow, swales, area drains, natural drainage, or wind.
  - b. Stockpiles of earth and other construction-related materials must be protected from being transported from the site by wind or water.
  - c. Fuels, oils, solvents, and other toxic materials must be stored in accordance with their listing and are not to contaminate the soil nor the surface waters. All approved toxic storage containers are to be protected from the weather. Spills must be cleaned up immediately and disposed of in a proper manner. Spills may not be washed into the drainage system.
  - d. Excess or waste concrete may not be washed into the public way or any drainage system. Provisions shall be made to retain concrete wastes on-site until they can be appropriately disposed of or recycled.
  - e. Trash and construction-related solid wastes must be deposited into a covered receptacle to prevent contamination of rainwater and dispersal by wind.
  - f. Sediments and other materials may not be tracked from the site by vehicle traffic. The construction entrance roadways must be stabilized so as to inhibit sediments from being deposited into the public ways. Accidental depositions must be swept up immediately and may not be washed down by rain or by any other means.

**B. Erosion Control Plan (ECP)**

1. The Contractor shall refer to the prepared Erosion Control Plan (ECP) and implement Best Management Practices (BMPs) necessary to control stormwater pollution from sediments, erosion and construction materials leaving the construction site.

**PART 2 – PRODUCTS (NOT APPLICABLE)**

**PART 3 – EXECUTION (NOT APPLICABLE)**

**END OF SECTION**

**SECTION 01 60 00**  
**PRODUCTS, MATERIALS, EQUIPMENT, AND SUBSTITUTIONS**

**PART 1 GENERAL**

**1.01 DEFINITIONS**

- A. The word "Products," as used in the Contract Documents, is defined to include purchased items for incorporation into the work, regardless of whether specifically purchased for the project or taken from the Contractor's stock of previously purchased products.
  - 1. Named Products: Items identified by manufacturer's product name, including make or model designation, indicated in the manufacturer's published product literature, that is current as of the date of the Contract Documents.
  - 2. Foreign Products: Distinguished from "domestic products," are considered items substantially manufactured (50 % or more of value) outside of the United States and its possessions; or produced or supplied by entities substantially owned (more than 50 %) by persons who are not citizens of nor living within the United States and its possessions.
- B. The word "Materials" is defined as products which must be substantially cut, shaped, worked, mixed, finished, refined, or otherwise fabricated, processed, installed, or applied to form work.
- C. The word "Equipment" is defined as products with operational parts, regardless of whether motorized or manually operated, and particularly including products with service connections (wiring, piping, and other like items).
- D. Substitution: A product, material, equipment, method of construction or system proposed by the Contractor which is different from that which is required by the Contract Documents. Proposed "substitutions" shall comply with the procedure for submission of substitutions as defined herein. In instances of dispute as to whether any proposal by the Contractor represents a "substitution", the judgment of the Architect shall govern. The burden of proof rests solely with the Contractor.
- E. Definitions in this section are not intended to negate the meaning of other terms used in the Contract Documents, including "specialties," "systems," "structure," "finishes," "accessories," "furnishings," "special construction," and similar terms, which are self-explanatory and have recognized meanings in the construction industry.
- F. Neither "Products" nor "Materials" nor "Equipment" includes machinery and equipment used for preparation, fabrication, conveying, and erection of the work.

**1.02 PRODUCT SELECTION**

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise shown or specified, unused at the time of installation.
  - 1. Provide products complete with accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for the intended use and effect.
  - 2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.
- B. Product Selection Procedures: Product selection is governed by the Contract Documents and governing regulations, not by previous Project experience. Procedures governing product selection include the following:
  - 1. Proprietary Specification Requirements: Where only a single product or manufacturer is named, provide the product indicated. Comply with Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.



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2. Semi-Proprietary Specification Requirements: Where two or more products or manufacturers are named, provide one of the products specified.
  - a. Where products or manufacturers are specified by name, accompanied by the term "or equal," or "or approved equal" comply with the Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.
3. Non Proprietary Specifications: When the Specifications list products or manufacturers that are available and may be incorporated in the Work, but do not restrict the Contractor to use of these products only, the Contractor may propose any available product that complies with Contract requirements.
4. Descriptive Specification Requirements: Where Specifications describe a product or assembly, listing exact characteristics required, with or without use of a brand or trade name, provide a product or assembly that provides the characteristics and otherwise complies with Contract requirements.
5. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply with these requirements, and are recommended by the manufacturer for the application shown or specified. General overall performance of a product is implied where the product is specified for a specific application.
  - a. Manufacturer's recommendations may be contained in published product literature, or by the manufacturer's certification of performance.
6. Compliance with Standards, Codes and Regulations: Where the Specifications only require compliance with an imposed code, standard or regulation, provide a product that complies with the standards, codes or regulations specified.
7. Visual Matching: Where Specifications require matching an established Sample, the Architect's decision will be final on whether a proposed product matches satisfactorily.
  - a. Where no product available within the specified category matches satisfactorily and also complies with other specified requirements, comply with provisions of the Contract Documents concerning "substitutions" for selection of a matching product in another product category, or for noncompliance with specified requirements.
8. Color Selection
  - a. As soon as possible, Contractor shall obtain from Subcontractors and submit to Architect, a complete list of materials for which colors are to be selected. Include manufacturer's name and pertinent data which will facilitate completion of color schedule until submittals and required samples have been submitted to and reviewed by Architect. Include items which may come in only one or a limited number of colors. Items which are specified without any reference to color, but which come in a color, shall be brought to the Architect's attention for their color selection. In no case shall the Contractor or Subcontractors select a color for materials, products or equipment for which colors are available without first consulting the Architect.





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- b. When the sentence "Color selected by Architect." is used in the specifications, it shall mean that color, texture or pattern will be selected by the Architect from the manufacturer's full range of standard and special colors. The sentence "Custom color selected by Architect.", "Match existing color." or "Match Architect's approved sample." shall mean that color, texture or pattern has been selected or that it will be selected by the Architect and that the Contractor shall provide color, texture or pattern conforming to that selection.
- 9. When, due to the nature of the material, the material is available in a range of colors, i.e., natural stone, brick, and tile, Contractor shall submit the full available range of colors for that material for the Architect's review. Materials not conforming to the approved color range will be rejected and Contractor shall remove nonconforming materials from the site and replace them with materials in the approved color range at the Contractor's expense.

**1.03 QUALITY ASSURANCE**

- A. Source Limitations: To the greatest extent possible for each unit of work, the Contractor shall provide products, materials, and equipment of a singular generic kind from a single source.
- B. Compatibility of Options: Where more than one choice is available as options for Contractor's selection of a product, material, or equipment, the Contractor shall select an option which is compatible with other products, materials, or equipment. Compatibility is a basic general requirement of product, material and equipment selections.

**1.04 MANUFACTURER'S INSTRUCTIONS**

- A. General: Manufactured articles, materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with the respective manufacturer's written instructions, unless more stringent requirements are specified.
- B. Differences or Conflicts Between Manufacturer's Written Instructions and Technical Sections of the Specifications: In case of any differences or conflicts between requirements of a manufacturer's written instructions and the technical sections of the specifications, the instructions of specifications having the more detailed and precise requirements which are specifically applicable to the Work in question, as determined by the Architect shall govern.

**1.05 MANUFACTURER'S NAMEPLATES**

- A. Nameplates and Other Identifying Markings Not to be Affixed on Exposed Surfaces: Manufacturer's name plates and other identifying markings shall not be affixed on exposed surfaces of manufactured items installed in finished spaces.
- B. Exception to the Requirement: This requirement does not apply to Underwriters' Laboratories labels where required. Each major component of mechanical and electrical equipment shall have, on a securely attached plate, in a conspicuous location, the manufacturer's name, address, model and serial number, capacity, rating and any other information required by the Mechanical and Electrical Specifications.

**1.06 SUBSTITUTIONS**

- A. The Contractor shall, to the greatest extent possible, provide the materials as specified in these Contract Documents. Where procurement of the material as specified is not possible or the Contractor would like to submit for consideration an alternative, the Contractor shall submit shop drawings in accordance with Section 013300 and shall clearly indicate the product being substituted.





**SECTION 01 60 00  
PRODUCTS, MATERIALS,  
EQUIPMENT, AND  
SUBSTITUTIONS**

**DIVISION 01**

**1.07 PRODUCT DELIVERY AND STORAGE**

- A. The Contractor shall deliver and store the products, materials and equipment in accordance with manufacturer's written recommendations and by methods and means which will prevent damage, deterioration, and loss including theft. Delivery schedules shall be controlled to minimize long-term storage of products at the Site and overcrowding of construction spaces. In particular, the Contractor shall ensure coordination to ensure minimum holding or storage times for flammable, hazardous, easily damaged, or sensitive materials to deterioration, theft, and other sources of loss.

**1.08 TRANSPORTATION AND HANDLING**

- A. Products shall be transported by methods to avoid damage and shall be delivered in undamaged condition in manufacturer's unopened containers and packaging.
- B. Products may be inspected prior to off-loading. Any materials found damaged shall be rejected and removed from the site.
- C. The Contractor shall provide equipment and personnel to handle products, materials, and equipment including those furnished by Goleta Water District, by methods to prevent soiling and damage.
- D. The Contractor shall provide additional protection during handling to prevent marring and otherwise damaging products, packaging, and surrounding surfaces.

**1.09 STORAGE AND PROTECTION**

- A. Products shall be stored in accordance with the manufacturer's written instructions and with seals and labels intact and legible. Sensitive products shall be stored in weather-tight, climate-controlled enclosures at a temperature.
  - 1. Loose granular materials shall be stored on solid flat surfaces in a well-drained area and shall be prevented from mixing with foreign matter.
- B. Storage shall be arranged in a manner to provide access for maintenance of stored items and for inspection.

**1.10 MAINTENANCE OF PRODUCTS IN STORAGE**

- A. The Contractor shall comply with manufacturer's product storage requirements and recommendations. The Contractor shall maintain a log of inspections and shall make the log available on request. The Contractor shall periodically inspect products to assure they are undamaged and are maintained under required conditions. The Contractor shall maintain manufacturer-required environmental conditions continuously.
- B. The Contractor shall ensure that surfaces of products exposed to the elements are not adversely affected and that weathering of finishes does not occur.
- C. For mechanical and electrical equipment, the Contractor shall provide a copy of the manufacturer's service instructions with each item and the exterior of the package shall contain notice that instructions are included.
- D. Products shall be serviced on a regularly scheduled basis, and a log of services shall be maintained and submitted as a record document prior to final acceptance.



**SECTION 01 60 00  
PRODUCTS, MATERIALS,  
EQUIPMENT, AND  
SUBSTITUTIONS**

**DIVISION 01**

**1.11 PROOF OF COMPLIANCE**

- A. Manufacturer's Certification of Product Compliance: Whenever the Contract Documents require that a product complies with Federal Specification, ASTM Designation, ANSI Specification or other association standard, the Contractor may be required to present documentation from the manufacturer certifying that the product complies therewith. Where requested or specified, submit supporting test data to substantiate compliance.

**PART 2 PRODUCTS NOT USED**

**PART 3 EXECUTION NOT USED**

**END OF SECTION**

**SECTION 01 64 00  
OWNER FURNISHED PRODUCTS**

**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

**1.02 ABBREVIATIONS AND ACRONYMS**

- A. FFE: Furniture, Fixtures, and Equipment.
- B. OFCI: Owner furnished, Contractor installed.
- C. OFOI, Owner furnished, Owner installed.
- D. Contractor furnished, Contractor installed.

**1.03 FURNITURE, FIXTURES AND EQUIPMENT (MATERIALS) OWNER FURNISHED  
CONTRACTOR INSTALLED (OFCI)**

- A. Certain materials identified in the Contract Documents as Owner Furnished Contractor Installed, OFCI, will be delivered to the Project site by the Owner.
- B. If designated in the Contract Documents to be Owner furnished Contractor installed, (OFCI), Contractor shall unload, store, uncrate, assemble, install, and connect Owner supplied materials.
- C. Contractor shall install OFCI materials in the locations and orientation as indicated in the Contract Documents. Contractor shall verify exact locations with OAR before final installation of OFCI materials.
- D. If required, OAR will furnish setting and or placement drawings for OFCI materials.
- E. Contractor shall install OFCI materials by proper means and methods to ensure an installation as recommended by the manufacturer. Contractor shall furnish and install all necessary fasteners and required blocking to properly install OFCI materials.
- F. Contractor shall install OFCI materials with manufacturer-recommended fasteners for the type of construction to which the OFCI materials are being fastened and/or anchored.
- G. Contractor shall provide final connections of any electrical, signal, gas, water, waste, venting and/or similar items to OFCI materials. Contractor shall, prior to final connection, verify the operating characteristics of OFCI materials are consistent with the designated supply.

**1.04 FURNITURE, FIXTURES AND EQUIPMENT (MATERIALS) - OWNER FURNISHED, OWNER  
INSTALLED (OFOI)**

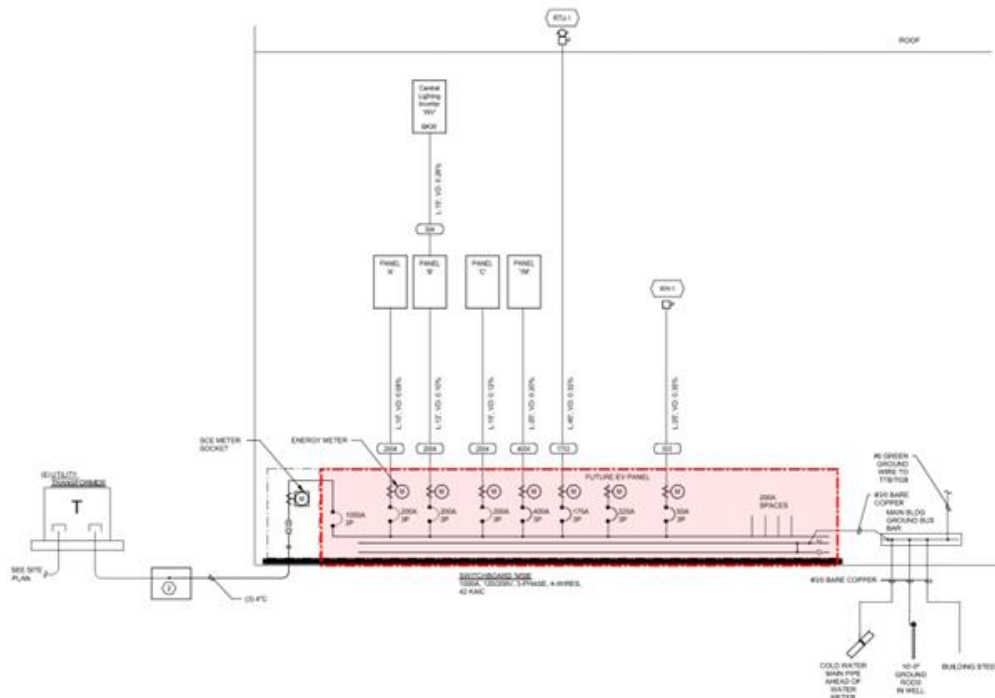
- A. Certain materials are identified in the Contract Documents as Owner Furnished, Owner Installed (OFOI)
- B. On dates and during times designated by Owner, Contractor shall provide clear off-loading, receiving, protected storage, and Owner's dumpster space areas for the use of Owner or Owner's third-party OFOI installation contractors. At such times, Contractor shall also make clear routes and access available to all rooms and spaces to receive OFOI materials.
- C. On dates and during times designated by Owner, Contractor shall provide access to the elevators for use of Owner or Owner's third-party OFOI installation contractors.
- D. Contractor shall cooperate fully with Owner or Owner's third-party OFOI installation contractors.
- E. Contractor may be requested by Owner to provide supplemental labor and equipment to support OFOI activities. Such requests must be submitted in accordance with the change order clauses of the Contract.
- F. Immediately prior to mobilization of Owner or Owner's third-party OFOI installation contractors, Owner shall document the condition of the Work in areas to be utilized for OFOI activities.

- G. Contractor shall not be responsible for damage caused by Owner or Owner's forces. Owner shall document the condition of the Work and report to Contractor any damage in areas utilized for OFOI activities.

## PART 2 - PRODUCTS

### 2.01 OWNER-FURNISHED CONTRACTOR INSTALLED PRODUCTS

- A. Switchboard "MSB" 1000amps by Square D is identified in the single line diagram below. All associated work and components for a successful installation shall be the responsibility of the Contractor.
- B. Anticipated delivery is TBD.
- C. Upon release of fabrication, the estimated delivery timeframe shall be provided along with the approved submittals to the Contractor.



## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Install in accordance with manufacturer's written instructions.
- B. The Contractor shall be responsible for coordinating panel board with contiguous work.

### 3.02 ATTACHMENTS

- A. Bill of Materials
- B. Shop Drawings - Switchboard

END OF SECTION

Seq #	Qty	Product Description
1	1	<p><b>Designation :</b> MSB-TBD</p> <p><b>Product Details:</b></p> <p>1 - Square D Standard Swbd-QED-2 Switchboard</p> <p>-----</p> <p>Square D Standard Swbd Designed and Tested in accordance with: UL 891/NATIONAL ELECTRIC CODE/NEMA PB-2 System Voltage - 208Y/120V 3Ph 4W 60Hz System Ampacity - 1000A Source Description - Single Main Bussing - Aluminum Plated w/Tin and Copper Plated w/Silver Neutral Bus - 100% Max Available Fault Current (RMS) - 42kA Enclosure - Type 1 Accessibility: Front Only Rodent Barrier Exterior Paint Color - ANSI 49 Ground Lug provided for each device SIS Control Wire Aluminum Ground Bus Seismic Qualified</p> <p>Dimensions</p> <p>-----</p> <p>2 - 36" Wide Section(s) 1 - 30" Wide Section(s) 3 - 24" Deep Enclosure(s) Dimensions: 102.00" W X 24" Max D X 91.5" H Approximate Weight: 2099.00 lbs / 952.11 kgs</p> <p>Incoming Requirements</p> <p>-----</p> <p>Suitable for Use As Service Entrance Entry Point: Left of Lineup, Through the Bottom Connection Type: Cable Reverse Feed Hot Sequence Utility: Southern Cal Edison (CA) Standard Door Pattern 1-30in Door, 2 Sockets</p> <p>Mains</p> <p>-----</p> <p>1 - 1000AS/1000AT 208V 80% Rated 65 kA 3 Pole UL, Fixed Mounted Electronic Trip Circuit Breaker: Type PK Ammeter Trip Unit, Long Time, Short Time, Instantaneous, Ground Fault Padlock Attachment</p> <p>Feeders</p> <p>-----</p> <p>3 - 250AS/200AT 208V 80% Rated 125 kA 3 Pole UL, Group Mounted Electronic Trip Circuit Breaker: Type JL Energy Trip Unit, Long Time, Short Time, Instantaneous 3 - 250AF/200AT 208V 80% Rated 125 kA 3 Pole UL, Group Mounted Electronic Trip Prepared Space: Type JL 1 - 250AS/225AT 208V 80% Rated 125 kA 3 Pole UL, Group Mounted Electronic Trip Circuit Breaker: Type JL Energy Trip Unit, Long Time, Short Time, Instantaneous 1 - 400AS/400AT 208V 80% Rated 125 kA 3 Pole UL, Group Mounted Electronic Trip Circuit Breaker: Type LL Energy Trip Unit, Long Time, Short Time,</p>

Instantaneous

1 - 400AS/225AT 208V 80% Rated 125 kA 3 Pole

UL, Group Mounted Electronic Trip

Circuit Breaker: Type LL

Energy Trip Unit, Long Time, Short Time,

Instantaneous

1 - 100AS/50AT 208V 80% Rated 125 kA 3 Pole

UL, Group Mounted Electronic Trip

Circuit Breaker: Type HL

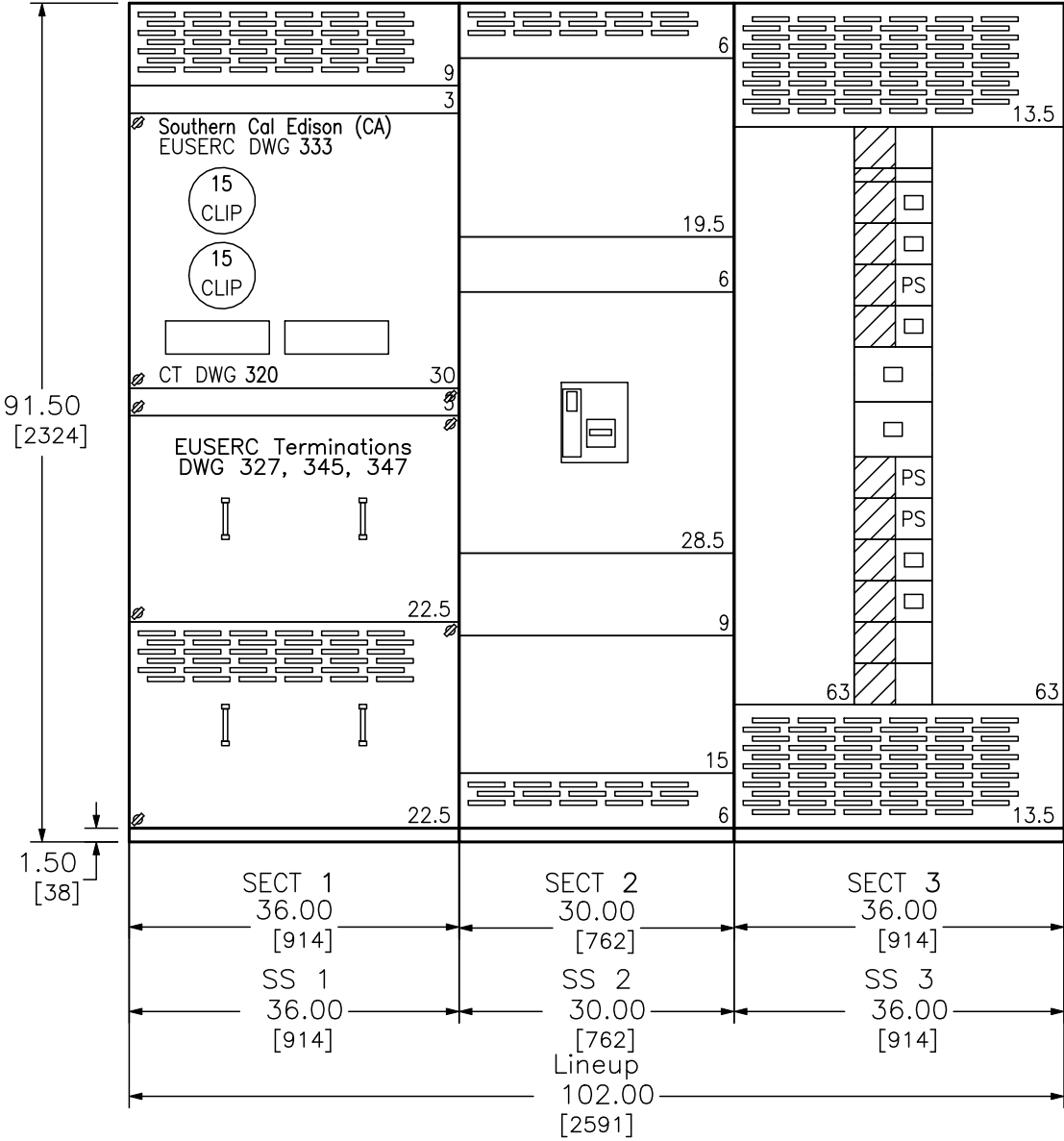
Energy Trip Unit, Long Time, Short Time,

Instantaneous

REV	DESCRIPTION	BY	DATE	-	----	--	--/--/--	-	----	--	--/--/--
-	----	--	--/--/--	-	----	--	--/--/--	-	----	--	--/--/--

T-bus 19.5 in                      T-bus 19.5 in                      T-bus 19.5 in

Ø:Denotes Sealing Screws



**SWITCHBOARD GENERAL NOTES**  
**PRODUCT DESCRIPTION & RATINGS**

**Power System Data**

208Y/120V 3Ph 4W 60Hz / 3 Phase Wye  
Solidly Grounded  
System Short Circuit Current Rating: 42kA RMS  
Incoming Section 1 Cable Through the Bottom Left of Lineup

**Bus System Data**

1000A Tin/Aluminum & Silver/Copper Main Bus  
(2) .25x2.00 IN/6x51 mm Al Bus Bar Per Phase/Neutral  
(1) .25x1.50 IN/6x38 mm Al Ground Bus

**Enclosure Data**

Type 1 Free Standing  
Exterior Paint Color: ANSI 49  
Front Accessibility Only Required  
Handling: Rollers & Lifting Assemblies  
Rodent barriers  
Base channels cannot be removed from EUSERC switchboard line-ups  
Utility sealing hardware installed for unmetered bus compartments

**Estimated Shipping Weight**

Shipping Split 1 757.00 lbs / 343.38 kgs  
Shipping Split 2 535.00 lbs / 242.68 kgs  
Shipping Split 3 807.00 lbs / 366.06 kgs  
Complete Lineup 2099.00 lbs / 952.11 kgs

**Code Standards**

U.L. Deadfront and suitable for use as Service Entrance  
when not more than six (6) disconnecting means are provided.

**Rating Nameplates**

ST1- Deadfront - Section Bus 1000A  
ST2- Service Entrance - Section Bus 1000A  
ST3- Deadfront - Section Bus 1000A

**PRODUCT INFORMATION**

**Wiring**

All wiring to be SIS Wire type


**Instruction Bulletins**

Reference 80043-055 For Handling, Installation,  
Anchoring, Inspection And Maintenance Information

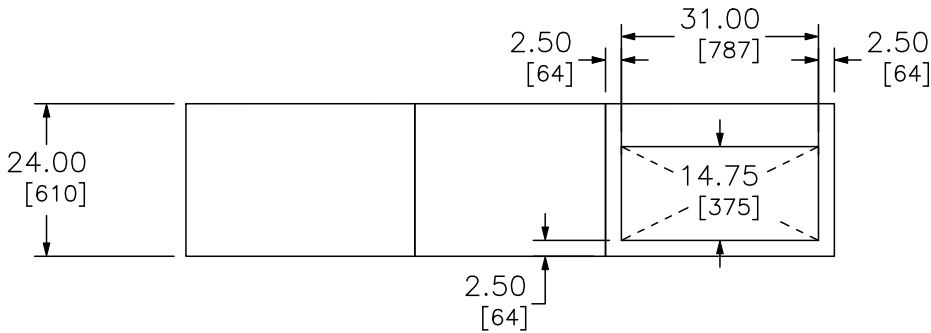
**Product Accessories/Options**

Seismic Qualified

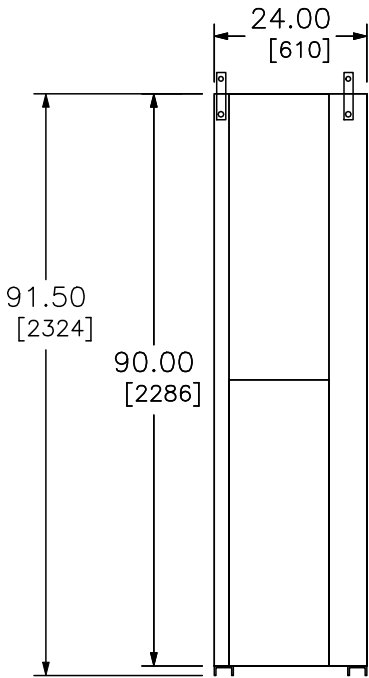
DUAL DIMENSIONS: INCHES  
MILLIMETERS

JOB NAME:	Goleta Valley Library	EQUIPMENT DESIGNATION:	MSB-TBD
JOB LOCATION:		EQUIPMENT TYPE:	QED-2 Switchboard
DRAWN BY:	CAD	DRAWING TYPE:	GENERAL NOTES
ENGR:			
DATE:	September 05 2025		
DRAWING STATUS:	QUOTE	DWG#	FQ-6279784-192119888-01
		PG 1	OF 2
		REV	-

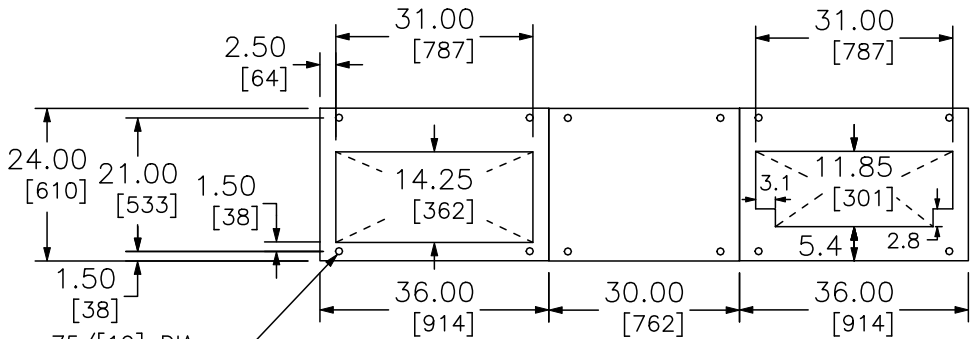
REV	DESCRIPTION	BY	DATE	-	----	--	--/--/--	-	----	--	--/--/--
-	----	--	--/--/--	-	----	--	--/--/--	-	----	--	--/--/--



TOP VIEW – FRONT



LEFT SIDE VIEW



.75/[19] DIA  
MTG HOLES OFFSET  
3.00/[76] TYP  
FROM SIDE

NOTE: ALL DEVICES REQUIRING DRILLING OR INSERTION IN MOUNTING PAD  
SUCH AS CONDUIT, ANCHORING STUDS, SLEEVE INSERTS, ETC.  
SHOULD BE INSTALLED BEFORE SETTING EQUIPMENT IN PLACE.

DUAL DIMENSIONS: INCHES  
MILLIMETERS

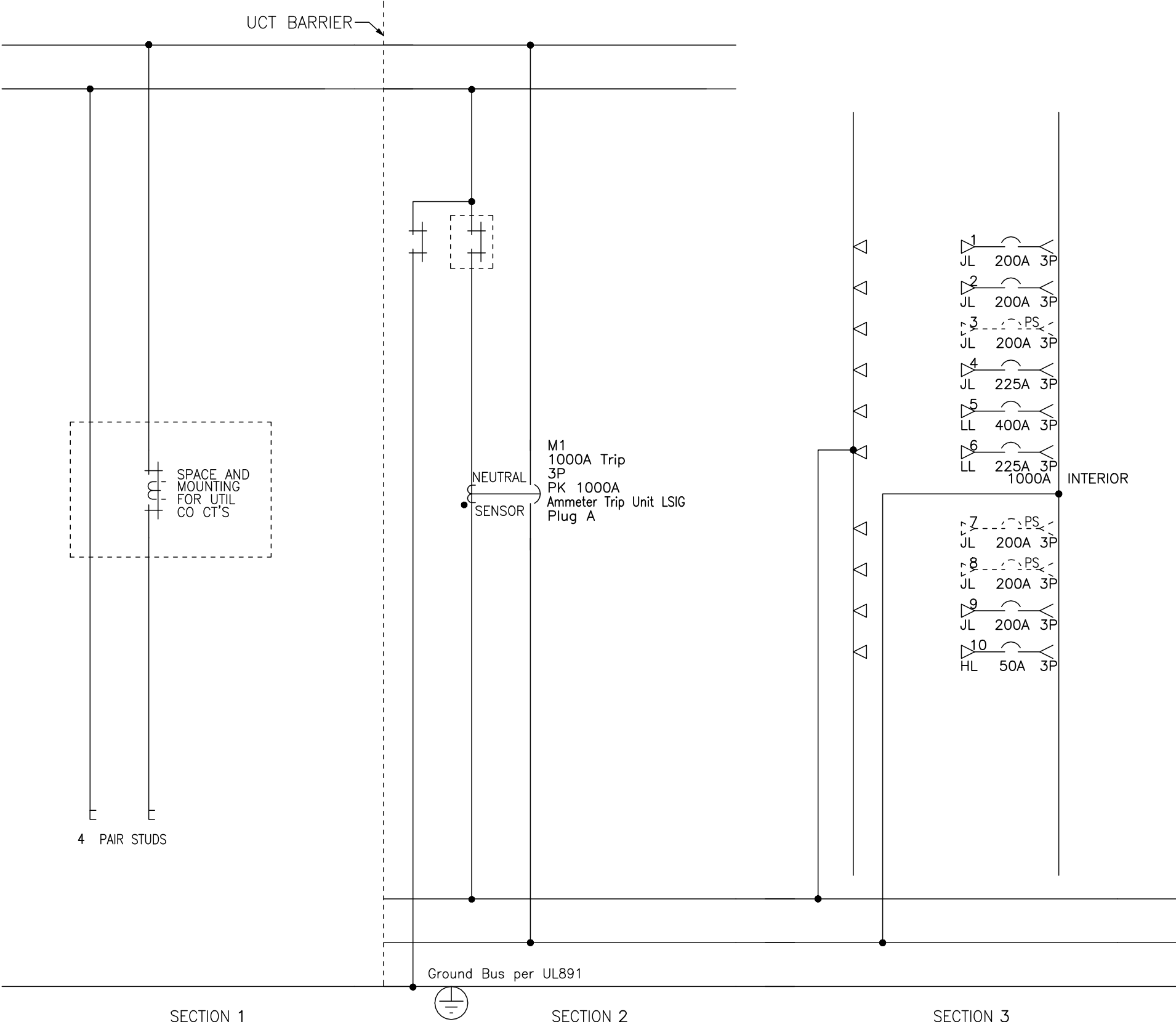
FLOOR PLAN – FRONT

JOB NAME:	Goleta Valley Library	EQUIPMENT DESIGNATION:	MSB-TBD
JOB LOCATION:		EQUIPMENT TYPE:	QED-2 Switchboard
DRAWN BY:	CAD	DRAWING TYPE:	SIDE, TOP VIEW & FLOOR PLAN
ENGR:			
DATE:	September 05 2025		
DRAWING STATUS:	QUOTE	DWG#	FQ-6279784-192119888-01





REV	DESCRIPTION	BY	DATE										
-	----	--	--/--/--	-	----	--	--/--/--	-	----	--	--/--/--	-	----




JOB NAME:	Goleta Valley Library	EQUIPMENT DESIGNATION:	MSB-TBD
JOB LOCATION:		EQUIPMENT TYPE:	QED-2 Switchboard
DRAWN BY:	CAD	DRAWING TYPE:	ONE LINE
ENGR:		<b>SQUARE D</b> by Schneider Electric	
DATE:	September 05 2025		
DRAWING STATUS:	QUOTE	DWG#	OQ-6279784-192119888-01
		PG 1	OF 2
		REV	-

REV	DESCRIPTION	BY	DATE	-	----	--	--/--/--	-	----	--	--/--/--
-	----	--	--/--/--	-	----	--	--/--/--	-	----	--	--/--/--

POWER STYLE QED-2 SWITCHBOARD

SECT NO	CKT NO	IMD /GMD CONFIG	DEVICE/FRAME RATING	TRIP AMP	FUSE/ TRIP	#P	DESIGNATION	N/P	LUG/WIRE INFORMATION				ACCESSORIES / NOTES
									QTY	PHASE WIRE RANGE	QTY	NEUT WIRE RANGE	
1	UCT	-	1000A	-	-	-	Southern Cal Edison (CA)	No	4	Pair Studs	4	Pair Studs	
2	M1	FIX	PK 1000A Plug A	1000A	A-LSIG	3P		No	-	-	-	-	GF PLA
3	1	4.5 in	JL 250A	200A	E-LSI	3P		No	1	3/0 - 350 kcmil	1	3/0 - 350kcmil	EN
3	2	4.5 in	JL 250A	200A	E-LSI	3P		No	1	3/0 - 350 kcmil	1	3/0 - 350kcmil	EN
3	3	4.5 in	JL 250A (PS)	(200A)	(LSI)	3P		No	1	3/0 - 350 kcmil	1	3/0 - 350kcmil	EN
3	4	4.5 in	JL 250A	225A	E-LSI	3P		No	1	3/0 - 350 kcmil	1	3/0 - 350kcmil	EN
3	5	6 in	LL 400A	400A	E-LSI	3P		No	2	3/0 - 250 kcmil	2	3/0 - 250 kcmil	EN
3	6	6 in	LL 400A	225A	E-LSI	3P		No	2	3/0 - 250 kcmil	2	3/0 - 250 kcmil	EN
3	7	4.5 in	JL 250A (PS)	(200A)	(LSI)	3P		No	1	3/0 - 350 kcmil	1	3/0 - 350kcmil	EN
3	8	4.5 in	JL 250A (PS)	(200A)	(LSI)	3P		No	1	3/0 - 350 kcmil	1	3/0 - 350kcmil	EN
3	9	4.5 in	JL 250A	200A	E-LSI	3P		No	1	3/0 - 350 kcmil	1	3/0 - 350kcmil	EN
3	10	4.5 in	HL 100A	50A	E-LSI	3P		No	1	#14 - 1/0 AWG	1	#14 - 1/0 AWG	EN

LEGEND	
EN	H-J-L Breaker Power Supply
GF	Ground Fault
PLA	Padlock Attachment-Fixed

JOB NAME:	Goleta Valley Library	EQUIPMENT DESIGNATION:	MSB-TBD
JOB LOCATION:		EQUIPMENT TYPE:	QED-2 Switchboard
DRAWN BY:	CAD	DRAWING TYPE:	SCHEDULE
ENGR:		 by Schneider Electric	
DATE:	September 05 2025		
DRAWING STATUS:	QUOTE	DWG#	OQ-6279784-192119888-01
		PG 2	OF 2
		REV	-

**SECTION 01 71 23  
FIELD ENGINEERING**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Layout of the work.
  - 2. Verification of work.
    - a. Owner reserves the right to verify any work that Inspector deems necessary.
    - b. Other sections that require the Surveyor to verify or measure installed work and related items. Surveyor shall perform such verifications or measurements at Contractor's expense. Contractor shall furnish a certification, signed by both Surveyor and Contractor, to the Inspector.
- B. Related Requirements:
  - 1. Section 01 11 00 - Summary of Work.
  - 2. Section 01 31 00 - Project Management and Coordination.
  - 3. Section 01 32 00 - Construction Progress Documentation.
  - 4. Section 01 33 00 - Submittal Procedures.
  - 5. Section 01 77 00 - Contract Closeout.

**1.02 SURVEY CONTROLS**

- A. Vertical Control shall use same benchmark used in the preparation of topographic survey. When Work consists of both on-site and off-site and benchmarks differ, an equation shall be indicated on Drawings.
- B. Horizontal control for existing structures shall be the property line.

**1.03 LAYOUT OF WORK**

- A. All work related to staking shall be by a Land Surveyor, or Civil engineer, registered with the State of California to perform land surveying and employed by Contractor.
- B. Before commencement of Work, surveyor shall locate all reference points and benchmarks to be used for vertical and horizontal control.
- C. Surveyor shall lay out entire Work, set grades, lines, levels, control points, elevations, grids and positions.
- D. Contractor shall not use permanent markings in any Work that will be exposed to final view.

**1.04 RECORD DOCUMENTS**

- A. Maintain complete and accurate log of all control and survey documentation as work progresses.
- B. Record, by coordinates, all utilities onsite with top of pipe elevations, at major grade and alignment changes, rim, grate or top of curb and flow line elevations of all drainage structures and sewer manholes.
- C. Indicate reference and control points on record drawings. The basis of elevation shall be one of the established benchmarks.
- D. Upon Substantial Completion, obtain and pay for reproducible plans. Deliver plans to OAR. Clearly indicate all differences between original drawings and completed work within specified tolerances.

**1.05 SUBMITTALS**

- A. Surveyor: Shall submit name, address and license number to OWNER, including any changes as they occur.

- B. Field notes: Upon request by OAR, submit copies of cut sheets, coordinate plots, data collector printouts, marked-up construction staking plans and other documentation as available to verify accuracy of field engineering work during and at completion of project. Submittals to OWNER must be signed and sealed by Surveyor and counter-signed by Contractor.
- C. Statement of Compliance: Contractor shall submit a statement of certification signed and sealed by Surveyor, counter-signed by Contractor indicating compliance with grades and alignment of construction plans at rough grade, fine grade and top of rock stages. Inspector shall approve survey submittals for each stage of construction prior to proceeding with work
- D. Upon Substantial Completion, Contractor shall obtain and pay for reproducible survey drawings (or "As Built").
- E. Completed record drawings shall be signed and certified as correct and within specified tolerances by a licensed surveyor. Originals and two sets of blueprints shall be submitted to Owner.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION**

**3.01 PREPARATION**

- A. Pre-mark areas of excavation in accordance with the requirements of "Dig-Alert". Request locators 2 days before commencing excavation.
- B. Before commencing Work, establish all horizontal and vertical reference points used in Contract Documents according to existing field conditions.
- C. Preserve established reference lines and benchmarks.
- D. Differentiate UPRR and city datum as applicable.
- E. Relocate bench marks that may interfere with Work.
- F. Reset and re-establish reference marks damaged or lost during construction.

**3.02 SURVEY REQUIREMENTS GENERAL**

- A. Establish a minimum of two permanent horizontal and vertical control points on Project site, remote from construction area, referenced to data established by control points.
- B. Provide a minimum of two permanent horizontal and vertical control points for the interior of the project and snap gridlines onto floor with non-staining chalk.
- C. Indicate reference points, relative to benchmark elevation, on record drawings.
- D. Provide grade stakes and elevations to construct over excavation and re-compaction, rough and final grades, paved areas, curbs, gutters, sidewalks, building pads, landscaped areas, and other areas as required.
- E. Calculate and layout proposed finished elevations and intermediate controls as required to provide smooth transitions between spot elevations indicated on Drawings.
- F. Provide stakes and elevations for grading, fill, and topsoil placement.
- G. Provide adequate horizontal and vertical control to locate utility lines, including but not limited to, storm, sewers, water mains, gas, electric and signal and provide vertical control in proportion to the slope of the line as required for accurate construction. Dry utilities will be based upon adequate horizontal and vertical control layout. Prior to trench closure, survey and record invert and flow line elevations. Survey and record top of curb and flow line elevations on finished concrete or asphaltic concrete (AC) surfaces at key locations such as beginning-of-curve (BC), end-of-curve (EC), grade breaks, corners or angle points in sufficient number to demonstrate the Work complies with the intent of the Contract Documents.
- H. Provide horizontal and vertical control for batter boards for drainage, utility, and other on-site structures as required.

- I. Furnish building corner offsets as required to adequately locate building pads. Provide cut and fill stakes within the building pad perimeter adequate to control both over excavation and re-compaction and the final sub-grade elevation of the building pad.
- J. Submit a certification signed by the surveyor confirming the elevations and locations of improvements are in conformance with the Contract Documents. The statement shall include survey notes for the finish floor and building pad, showing the actual measured elevations on the completed sub-grade, recorded to the nearest 0.01 of a foot. Building pad tolerance will be plus or minus 0.1 of a foot.
- K. Establish a minimum of two permanent horizontal and vertical control points on Project site, remote from building area, referenced to data established by survey control points.
- L. Mark boundaries for rights-of-way dedications and easements for utilities prior to making location of buildings and utilities.
- M. Layout all lines, elevations and measurements needed for construction or installation of buildings, grading, paving utilities according to the following:
  - 1. Identify site boundary, property lines.
  - 2. Provide working benchmarks.
  - 3. Set stakes for Bottom of Excavated Plane (B.E.P.).
  - 4. Set gridlines, radii, working points etcetera, for foundation.
  - 5. Set and verify building pad elevations.
  - 6. Set finish floor elevations.
  - 7. Stake location and elevations for exterior ramps and stairs.
  - 8. Set gridlines, radii, working points, etcetera, for all floors of multi-story buildings.
  - 9. Set storm drain and sanitary sewer inverts and other utilities as needed at 5-foot off-set from building lines.
  - 10. For new facilities, establish permanent onsite Benchmark with 2-inch diameter brass disk. Location of Benchmark to be determined by OWNER.

### **3.03 SURVEY REQUIREMENTS FOR GRADING**

- A. Provide grade stakes and elevations as follows:
  - 1. Removal limits (cut lines).
  - 2. Rough grade staking: 60-foot maximum grid plus additional stakes at grade changes and pertinent locations. Flag all grade changes including ridges, flow lines and grade breaks.
  - 3. Fine grade for top of dirt: 30-foot maximum grid plus additional stakes at grade changes and pertinent locations. Flag all grade changes including ridges, flow lines and grade breaks.
  - 4. Verify fine grade for top of rock: 30-foot maximum grid plus additional stakes at grade changes and pertinent locations. Flag all grade changes including ridges, flow lines and grade breaks.
  - 5. Finish grade marks on all buildings, structures and at pertinent locations
  - 6. Finish grades and offsets for all concrete work, utilities, landscape areas, and structures.
  - 7. Offsite improvements: set grades and provide grade sheets as required by local authorities.
- B. Provide a minimum of two permanent horizontal and vertical control points onsite, remote from building area, referenced to data established by survey control points.

**3.04 SURVEY REQUIREMENTS FOR UTILITIES**

- A. Locate “wet” utility lines and provide vertical control proportionate to slope of line as required for accurate construction. “Dry” utilities shall have adequate horizontal and vertical control layout supplied by others.
- B. Prior to back-filling trench, survey and record invert and flow line elevations. Survey and record top of curb and flow line elevations on finished surfaces at key locations (such as Back of Curbs, grade breaks, corners or angle points) in sufficient number to demonstrate Work complies with intent of Contract Documents.
- C. Provide horizontal and vertical control for batter boards for drainage, utility, and other on-site structures as required.
  - 1. Set grades for vaults one inch higher than adjacent surrounding design grades, unless noted otherwise.
- D. Leave all trenches open until required inspection is completed.

**3.05 SURVEY REQUIREMENTS FOR STRUCTURES**

- A. Furnish building corner offsets as required to adequately locate building pads. Provide cut and fill stakes within building pad perimeter adequate to control both over excavation and re-compaction and final sub-grade elevation of building pad.
- B. Submit a certification signed by a surveyor confirming elevations and locations of improvements are in conformance with Contract Documents. Statement shall include survey notes for finish floor and building pad, showing actual measured elevations on completed sub-grade, recorded to the nearest 0.01 of a foot. Building pad tolerance will be plus or minus 0.1 of a foot.

**END OF SECTION**

**SECTION 01 73 29  
CUTTING AND PATCHING**

**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. This Section specifies procedural requirements for cutting and patching.

**1.02 RELATED REQUIREMENTS**

- A. Section 01 29 73 - Schedule of Values.
- B. Section 01 31 00 - Project Coordination.
- C. Section 01 33 00 - Submittal Procedures.
- D. Section 01 71 23 - Field Engineering.
- E. Section 01 78 36 - Warranties.
- F. Section 02 41 00 - Demolition.

**1.03 SUBMITTALS**

- A. The word "cutting" as used in the Contract Documents includes, but is not limited to, cutting, drilling, chopping, and other similar operations, and the word "patching" includes, but is not limited to, patching, rebuilding, reinforcing, repairing, refurbishing, restoring, replacing, or other similar operations.
- B. Cutting and Patching Proposal: Contractor shall submit a proposal describing procedures well in advance of the time cutting and patching will be performed if the Contract Documents require approval of these procedures before proceeding. Include the following information, as applicable, in the proposal:
  - 1. Describe the extent of cutting and patching required. Denote how it will be performed and indicate why it cannot be avoided.
  - 2. Describe anticipated results in terms of changes to existing construction. Include changes to structural elements and operating components as well as changes in the building's appearance or other significant visual elements.
  - 3. List products to be used and firms or entities that will perform this Work.
  - 4. Indicate dates when cutting and patching will be performed.
  - 5. Utilities: List utilities that cutting and patching operations will disturb or affect. List utilities to be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted.
  - 6. Where cutting and patching involves adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with the original structure.
  - 7. Review by Architect prior to proceeding with cutting and patching does not waive Architect right to later require complete removal and replacement of defective Work.

**1.04 QUALITY ASSURANCE**

- A. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would change their load-carrying capacity or load-deflection ratio.
  - 1. Obtain approval from Architect of the cutting and patching proposal before cutting and patching the following structural elements:
    - a. Foundation construction.
    - b. Bearing and retaining walls.
    - c. Structural concrete.
    - d. Structural steel.
    - e. Structural decking.

- f. Miscellaneous structural metals.
  - g. Equipment supports.
  - h. Piping, ductwork, vessels, and equipment.
- B. Operational Limitations: Do not cut and patch operating elements or related components in a manner that would result in reducing their capacity to perform as intended. Do not cut and patch operating elements or related components in a manner that would result in increased maintenance or decreased operational life or safety.
  - 1. Obtain a review of the cutting and patching proposal before cutting and patching the following operating elements or safety-related systems:
    - a. Primary operational systems and equipment.
    - b. Air or smoke barriers.
    - c. Water, moisture, or vapor barriers.
    - d. Membranes and flashings.
    - e. Fire protection systems.
    - f. Control systems.
    - g. Communication and/or data systems.
    - h. Conveying systems.
    - i. Electrical wiring systems.
- C. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in the opinion of Architect, reduce the building's aesthetic qualities. Do not cut and patch construction in a manner that would result in visual evidence of cutting and patching. Remove and replace Work cut and patched in a visually unsatisfactory manner.
  - 1. If possible, retain the original installer or fabricator to cut and patch the exposed Work listed below. If it is impossible to engage the original installer or fabricator, engage another recognized experienced and specialized firm.
    - a. Firestopping.
    - b. Acoustical ceilings.
    - c. Acoustical panels.
    - d. Finished wood flooring.
    - e. HVAC enclosures, cabinets, or covers.
    - f. Ceramic and quarry tile.
    - g. Gypsum board.
    - h. Masonry (exterior and interior where exposed).

#### **1.05 WARRANTY**

- A. Warranties: Replace, patch, and repair material and surfaces cut or damaged by methods and with materials in such a manner as not to void any warranties required or existing.

#### **PART 2 - PRODUCTS (NOT APPLICABLE)**

#### **PART 3 - EXECUTION**

##### **3.01 INSPECTION**

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed before cutting. If unsafe or unsatisfactory conditions are encountered, take corrective action before proceeding.
  - 1. Before proceeding, meet at the Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.



**3.02 PREPARATION**

- A. Protection: Protect existing improvements and Work during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of existing improvements or Work that might be exposed during cutting and patching operations.
- B. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- C. Where the Work requires sandblasting of existing surfaces in order to receive new materials secured by cementitious, adhesive or chemical bond, completely remove existing finishes, stains, oil, grease, bitumen, mastic and adhesives or other substances deleterious to the new bonding or fastening of new Work. Utilize wet sand blasting for interior surfaces and for exterior surfaces where necessary to prevent objectionable production of dust.

**3.03 PERFORMANCE**

- A. General: Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay. Carefully remove existing Work to be salvaged and/or reinstalled. Protect and store for reuse into the Work.
- B. Cutting: Cut existing construction using methods least likely to damage elements retained or adjoining Work. Where possible, review proposed procedures with the original installer; comply with the original installer's recommendations.
  - 1. In general, where cutting, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
  - 2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
  - 3. Cut through concrete and masonry using a cutting machine, such as a carborundum saw or a diamond-core drill. Saw cut reinforcing bars and paint ends with bituminous paint except where bonded into new concrete or masonry.
  - 4. Comply with requirements of applicable Sections of Divisions 31, 32, and 33 where cutting and patching requires excavating, backfill, and recompaction.
  - 5. Sheet Metal: Remove back to joint, lap, or connection. Secure loose or unfastened ends or edges and seal watertight.
  - 6. Plaster: Cut back to sound plaster on straight lines, and back bevel edges of remaining plaster. Trim existing lath and prepare for new lath.
  - 7. Gypsum Wallboard: Cut back on straight lines to undamaged surfaces with at least two opposite cut edges centered on supports.
  - 8. Tile: Cut back to sound tile and backing on joint lines.
- C. Patching: Patch with durable seams that are as invisible as possible. Comply with required tolerances.
  - 1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation. Verify conditions of existing substrates prior to executing Work.
  - 2. Restore exposed finishes of patched areas and extend finish restoration into retaining adjoining construction in a manner that will eliminate all evidence of patching and refinishing.
  - 3. Concrete: Maintain cut edges in a moist condition for twenty four hours prior to the placement of new concrete. In lieu of this an epoxy adhesive may be provided. Finish placed concrete to match existing unless noted otherwise. Concrete shall have a compressive strength of 3,000 psi where installed to repair and match existing improvements, unless noted otherwise.



## **SECTION 01 73 29 CUTTING AND PATCHING**

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4. Metal Fabrications: Items to remain exposed shall have their edges cut and ground smooth and rounded.
5. Gypsum Wallboard: Fasten cut edges of wallboard. Install patches with at least two opposite edges centered on supports and secure at 6-inch centers. Tape and finish joints and fastener heads. Patching shall be non-apparent when painted or finished.
6. Acoustical Ceilings: Comply with the requirements for new Work specified in related sections of the Contract Documents.
7. Painting: Prepare areas to be patched, patch and paint as specified under related sections of the Contract Documents.

### **3.04 CLEANING**

- A. Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar items. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged coverings to their original condition.

**END OF SECTION**

**SECTION 01 74 19**  
**CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Section Includes: administrative and procedural requirements for the following:
  - 1. Salvaging nonhazardous construction and demolition waste.
  - 2. Recycling nonhazardous construction and demolition waste.
  - 3. Disposing of nonhazardous construction and demolition waste.

**1.02 DEFINITIONS**

- A. Alternative daily cover: Cover material other than earthen material placed on the surface of the active face of a municipal solid waste landfill at the end of each operating day to control vectors, fires, odors, blowing litter, and scavenging.
- B. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- C. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations
- D. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- E. Extended Producer Responsibility: Closed-loop program, also known as product take-back, are measures undertaken by a producer to accept its own and sometimes other manufacturers' products as post-consumer waste at the end of the product's useful life to recover and recycle the materials for use in new products of the same type.
- F. Material Stream: A material flow coming from a jobsite into markets for building materials including a specific material category that is diverted in a specific way or a mixture of several material categories that are diverted in a specific way.
- G. On-site Waste Diversion: On site reuse including crushing asphalt, concrete, and masonry for infill or aggregate.
- H. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- I. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- J. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

**1.03 PERFORMANCE REQUIREMENTS**

- A. Contractor shall follow City of Goleta Municipal Code Chapter 8.10 Article IV Mandatory Recycling of Construction and Demolition Waste.
- B. Develop a waste management plan that results in end-of-Project rates for salvage/recycling of at least 65% by weight (minimum allowable) of total nonhazardous construction and demolition waste generated by the Work. Higher diversion rates (such as 75%) are encouraged where feasible, with a minimum of four separate diverted material streams if practicable. Compliance shall be demonstrated in accordance with CALGreen Section 5.408 and City of Goleta Municipal Code Section 8.10.

**1.04 SUBMITTALS**

- A. General: Develop a Waste Management Plan (WMP) according to requirements in this Section.



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- B. Contractor shall submit a completed WMP that indicates all of the following:
1. The estimated volume or weight of project construction and demolition debris, by materials type, to be generated;
  2. The maximum volume or weight of such materials that can feasibly be diverted via reuse or recycling;
  3. The vendor and facility that the applicant proposes to use to collect and receive recyclable material; and
  4. The estimated volume or weight of construction and demolition debris that will be taken to a landfill.
- C. Informational Submittals: Waste Reduction Progress Reports
1. Concurrent with each Application for Payment, submit report. Include the following information, through the submission of waste hauling tickets, recycling receipts, or other forms of documentation:
    - a. Material category.
    - b. Total quantity of waste in tons.
    - c. Quantity of waste salvaged, in tons.
    - d. Quantity of waste recycled, in tons.
  2. Quantity of waste diverted on site, in tons.
    - a. Total quantity of waste diverted (salvaged, recycled, and on-site diversion) in tons.
    - b. Total quantity of waste diverted salvaged, recycled, and on-site diversion) as a percentage of total waste.
    - c. Location and name of facilities, organizations or landfills receiving waste.
    - d. For commingled materials, provide the annual reporting rate for that facility. To count toward the corresponding credit (MR Credit Construction and Demolition Waste Management), commingled recycling facilities must be able to provide diversion rates either specific to the project, or an average diversion rate for the facility that is regulated by the local or state authority. The average recycling rate for the facility must exclude alternative daily cover (ADC).
    - e. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
- D. Post-Construction Waste Reduction & Recycling Summary Report
1. Within 30 days after completion of the demolition phase, and again within 30 days after completion of the construction phase, Contractor shall submit documentation demonstrating compliance with Sections 8.10.600 and 8.10.620 of the Goleta Municipal Code. Submittal is a condition of final inspection, issuance of a certificate of occupancy, or other final project approval.
  2. Documentation shall include a final Waste Management Plan (WMP) showing actual tonnage of all construction and demolition waste, supported by original receipts, certified copies of weight tickets, and other records from recycling companies, deconstruction contractors, and landfill/disposal facilities. These records shall verify whether waste was recycled, reused, salvaged, or disposed.
  3. All construction and demolition waste shall be weighed to the maximum extent practical, in accordance with applicable regulatory standards for scale accuracy and maintenance. Where weighing is not feasible, use volumetric measurement. Convert volume to weight using standardized conversion factors approved by the City.



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**1.05 QUALITY ASSURANCE**

- A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION**

**3.01 PLAN IMPLEMENTATION**

- A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
- B. Comply with operation, termination, and removal requirements in Section 01 50 00 "Temporary Facilities and Controls."

**3.02 TRAINING:**

- A. Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.
- B. Distribute waste management plan to everyone concerned within three days of submittal return.
- C. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

**3.03 RECYCLING CONSTRUCTION WASTE, GENERAL**

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall be shared equally by Owner and Contractor.
- C. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.
- D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project Site to the maximum extent practical according to approved construction waste management plan.
  - 1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project Site. Include list of acceptable and unacceptable materials at each container and bin.
  - 2. Inspect containers and bins for contamination and remove contaminated materials if found.
  - 3. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
  - 4. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
  - 5. Store components off the ground and protect from the weather.
  - 6. Remove recyclable waste from Owner's property and transport to recycling receiver or processor.

**3.04 RECYCLING CONSTRUCTION WASTE, BEST PRACTICES**

- A. Packaging:
  - 1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
  - 2. Polystyrene Packaging: Separate and bag materials.



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3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project Site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
- B. Commingled Waste Recycling:
  1. If utilizing a commingled waste strategy, the General Contractor shall select a facility that meets one of the following:
    - a. Facility has an average diversion rate and is regulated by the local or state authority and must exclude alternative daily cover (ADC). This system must be a closed system; shipping waste to another municipality to manage, thus burdening another system, does not count as diverting the waste.
    - b. The waste-sorting facility shall provide a waste diversion percentage specific to the project's waste based on measurement of each component waste material. Visual inspection is not an acceptable method of evaluation for documenting this percentage.
- C. Source Separated Waste Recycling:
  1. If utilizing a source separation waste strategy, the Construction Waste Management Plan shall include a list of anticipated types and quantities of waste materials generated from the Project Site and proposed siting locations (including map) for waste/recycling containers. The plan shall identify materials to be recycled, re-used or salvaged. It shall include efforts at source reduction, material handling procedures and collection of weight and hauling destination information.
  2. Source Reduction: List processes that minimize waste such as working with suppliers to take back or buy back substandard, rejected or unused items and to deliver supplies using returnable pallets and containers. Also include procedures to minimize breakage, mishandling, contamination, and other factors that reduce job site waste.
  3. Material Handling Procedures: List means by which source separated waste materials will be protected from contamination, and the means for recycling them consistent with requirements for acceptance by designated facilities
  4. Implement recycling program that includes separate collection of waste materials of following types as applicable to Project:
    - a. Asphalt.
    - b. Land clearing debris.
    - c. Soil.
    - d. Trees and shrubs.
    - e. Concrete and concrete blocks.
    - f. Brick and masonry materials.
    - g. Wood.
    - h. Cardboard and paper packaging materials.
    - i. Plastics.
    - j. Ferrous metal.
    - k. Non-ferrous metals (e.g. copper, aluminum, etc.).
    - l. Glass.
    - m. Food and beverage containers.



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- n. Electrical fixtures and wires.
- o. Other (where applicable)
- D. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.

**3.05 DISPOSAL OF WASTE**

- A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, 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.
- C. Disposal: Remove waste materials from Owner's property and legally dispose of them.

**3.06 FORMS**

- A. Construction Waste Management (CWM) Plan Form
- B. Post-Construction Waste Reduction & Recycling Summary Report
- C. CWM Worksheet – complete and submit with monthly progress reports.
- D. CWM Acknowledgment – each subcontractor foreman shall sign and return prior to starting work on site.



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**CONSTRUCTION WASTE MANAGEMENT (CWM) PLAN**

**NOTE: THIS SAMPLE FORM MAY BE USED TO ASSIST IN DOCUMENTING COMPLIANCE  
WITH THE WASTE MANAGEMENT PLAN.**

**PROJECT NAME:** \_\_\_\_\_

**JOB #:** \_\_\_\_\_

**PROJECT MANAGER:** \_\_\_\_\_

**WASTE HAULING COMPANY:** \_\_\_\_\_

**CONTACT NAME:** \_\_\_\_\_

1. All subcontractors shall comply with the project's construction waste management plan.
2. All subcontractor foremen shall sign the cwm plan acknowledgment sheet.
3. Subcontractors who fail to comply with the waste management plan will be subject to backcharges or withholding of payment, as deemed appropriate. For instance, subcontractors who contaminate debris boxes that have been designated for a single material type will be subject to backcharge or withheld payment, as deemed appropriate.
4. The project's overall rate of waste diversion will be \_\_\_\_%.
5. This project shall generate the least amount of waste possible by planning and ordering carefully, following all proper storage and handling procedures to reduce broken and damaged materials and reusing materials whenever possible. The majority of the waste that is generated on this jobsite will be diverted from the landfill and recycled for other use.
6. Spreadsheet 1, enclosed, identifies the waste materials that will be generated on this project, the diversion strategy for each waste type and the anticipated diversion rate.
7. Waste prevention and recycling activities will be discussed at the beginning of weekly subcontractor meetings. As each new subcontractor comes on-site, the wmp coordinator will present him/her with a copy of the cwm plan and provide a tour of the jobsite to identify materials to be salvaged and the procedures for handling jobsite debris. All subcontractor foremen will acknowledge in writing that they have read and will abide by the cwm plan. Subcontractor acknowledgment sheet enclosed. The cwm plan will be posted at the jobsite trailer.
8. Salvage: excess materials that cannot be used in the project, nor returned to the vendor, will be offered to site workers, the owner, or donated to charity if feasible.
9. [hauling company] will provide a commingled drop box at the jobsite for most of the construction waste. These commingled drop boxes will be taken to [sorting facility name and location]. The average diversion rate for commingled waste will be \_\_\_\_%. As site conditions permit, additional drop boxes will be used for particular phases of construction (e.g., concrete and wood waste) to ensure the highest waste diversion rate possible.
10. In the event that the waste diversion rate achievable via the strategy described in (6) above, is projected to be lower than what is required, then a strategy of source-separated waste diversion and/or waste stream reduction will be implemented. Source separated waste refers to jobsite waste that is not commingled but is instead allocated to a debris box designated for a single material type, such as clean wood or metal.





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**Notes:**

Waste stream reduction refers to efforts taken by the builder to reduce the amount of waste generated by the project to below four (4) pounds per square foot of building area.

When using waste stream reduction measures, the gross weight of the product is subtracted from a base weight of four (4) pounds per square foot of building area. This reduction is considered additional diversion and can be used in the waste reduction percentage calculations.

[hauling company] will track and calculate the quantity (in tons) of all waste leaving the project and calculate the waste diversion rate for the project. [hauling company] will provide project manager with an updated monthly report on gross weight hauled and the waste diversion rate being achieved on the project. [hauling company's] monthly report will track separately the gross weights and diversion rates for commingled debris and for each source-separated waste stream leaving the project. In the event that [hauling company] does not service any or all of the debris boxes on the project, the [hauling company] will work with the responsible parties to track the material type and weight (in tons) in such debris boxes in order to determine waste diversion rates for these materials.

In the event that subcontractors furnish their own debris boxes as part of their scope of work, such subcontractors shall not be excluded from complying with the cwm plan and will provide [hauling company] weight and waste diversion data for their debris boxes.

In the event that site use constraints (such as limited space) restrict the number of debris boxes that can be used for collection of designated waste the project superintendent will, as deemed appropriate, allocate specific areas onsite where individual material types are to be consolidated. These collection points are not to be contaminated with non-designated waste types.

Debris from jobsite office and meeting rooms will be collected by [disposal service company]. [disposal service company] will, at a minimum, recycle office paper, plastic, metal and cardboard.



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**CONSTRUCTION WASTE MANAGEMENT (CWM) WORKSHEET**

**NOTE: THIS SAMPLE FORM MAY BE USED TO ASSIST IN DOCUMENTING COMPLIANCE WITH  
THE WASTE MANAGEMENT PLAN.**

<b>PROJECT NAME:</b> _____			
<b>JOB NUMBER:</b> _____			
<b>PROJECT MANAGER:</b> _____			
<b>WASTE HAULING COMPANY:</b> _____			
<b>CONSTRUCTION WASTE MANAGEMENT (CWM) PLAN</b>			
	<b>DIVERSION METHOD:</b>		
<b>WASTE MATERIAL TYPE</b>	<b>COMMINGLED AND SORTED OFF SITE</b>	<b>SOURCE SEPARATED ON SITE</b>	<b>PROJECTED DIVERSION RATE</b>
ASPHALT			
CONCRETE			
SHOTCRETE			
METALS			
WOOD			
RIGID INSULATION			
FIBERGLASS INSULATION			
ACOUSTIC CEILING TILE			
GYPSUM DRYWALL			
CARPET/CARPET PAD			
PLASTIC PIPE			
PLASTIC BUCKETS			
PLASTIC			
HARDIPLANK SIDING AND BOARDS			
GLASS			
CARDBOARD			
PALLETS			
JOB OFFICE TRASH, PAPER, GLASS & PLASTIC BOTTLES, CANS, PLASTIC			
ALKALINE AND RECHARGEABLE BATTERIES, TONER CARTRIDGES, AND ELECTRONIC DEVICES			
OTHER:			
OTHER:			



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<b>PROJECT NAME:</b> _____			
<b>JOB NUMBER:</b> _____			
<b>PROJECT MANAGER:</b> _____			
<b>WASTE HAULING COMPANY:</b> _____			
<b>CONSTRUCTION WASTE MANAGEMENT (CWM) PLAN</b>			
	<b>DIVERSION METHOD:</b>		<b>PROJECTED DIVERSION RATE</b>
<b>WASTE MATERIAL TYPE</b>	<b>COMMINGLED AND SORTED OFF SITE</b>	<b>SOURCE SEPARATED ON SITE</b>	
<b>OTHER:</b>			
<b>OTHER:</b>			



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**CONSTRUCTION WASTE MANAGEMENT (CWM) ACKNOWLEDGMENT**

**NOTE: THIS SAMPLE FORM MAY BE USED TO ASSIST IN DOCUMENTING COMPLIANCE  
WITH THE WASTE MANAGEMENT PLAN.**

**PROJECT NAME:** \_\_\_\_\_

**JOB NUMBER:** \_\_\_\_\_

**PROJECT MANAGER:** \_\_\_\_\_

**WASTE HAULING COMPANY:** \_\_\_\_\_

**CWM PLAN ACKNOWLEDGMENT**

THE FOREMAN FOR EACH NEW SUBCONTRACTOR THAT COMES ON SITE IS TO RECEIVE A COPY OF THE CONSTRUCTION WASTE MANAGEMENT PLAN AND COMPLETE THIS ACKNOWLEDGMENT FORM.

I HAVE READ THE WASTE MANAGEMENT PLAN FOR THE PROJECT; I UNDERSTAND THE GOALS OF THIS PLAN AND AGREE TO FOLLOW THE PROCEDURES DESCRIBED IN THIS PLAN.

<b>DATE</b>	<b>SUBCONTRACTOR COMPANY NAME</b>	<b>FOREMAN NAME</b>	<b>SIGNATURE</b>

**END OF SECTION**

**SECTION 01 77 00  
CONTRACT CLOSEOUT**

**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. This Section includes administrative and procedural requirements for Contract Closeout, including, but not limited to, the following:
  - 1. Inspection procedures.
  - 2. Project record documents submittal.
  - 3. Operation and maintenance manual submittal.
  - 4. Owner orientation and instruction.
  - 5. Final cleaning.

**1.02 RELATED REQUIREMENTS**

- A. Section 01 33 00 - Submittal Procedures.
- B. Section 01 50 00 – Temporary Facilities and Controls.
- C. Section 01 78 36 - Warranties.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION**

**3.01 SUBSTANTIAL COMPLETION**

- A. Inspection Procedures: On receipt of the Request for Certificate of Substantial Completion, OAR will authorize commencement of inspection. Inspector, OAR, Contractor and Architect will inspect the Work.
  - 1. If after inspection of the Work, OAR does not consider the Work substantially complete, OAR will notify Contractor.
  - 2. If after inspection, OAR considers the Work substantially complete, Inspector shall prepare a comprehensive Punch List of items to be corrected.
    - a. Inspector may repeat inspection to assure the Work is corrected.
    - b. Results of the completed inspection will form a partial basis of the requirements for Release of Retention.

**3.02 ADMINISTRATIVE CLOSEOUT**

- A. Re-inspection Procedures: Inspector, OAR, Contractor and Architect may inspect the Work upon notice, including final inspection of Punch List items from earlier inspections, has been corrected, except for items whose completion is delayed under circumstances acceptable to OAR.
  - 1. Owner has the right to preclude Contractor from Punch List correction and documents submittals after the Contract Completion date; unless Owner elects to authorize Contractor to extend Administrative Contract duration. Contractor will be assessed actual cost for the unsettled items. Withholds amounts exceeding actual costs to correct or to obtain deliverable will be released.
  - 2. If allowed by the OAR, re-inspection will be repeated, but may be assessed against Contractor if Owner is subject to additional professional service and/or additional costs of inspection.

### 3.03 PROJECT RECORD DOCUMENT SUBMITTAL

- A. General: Do not use project record documents for construction purposes. Protect record documents from deterioration and loss. Provide access to record documents for Architect, Inspector and OAR reference during normal working hours. Project record document shall be updated on a weekly basis. Prior to submitting each application for payment, secure Inspector and Architect approval of project record documents.
- B. Record Drawings: Maintain a clean, undamaged set of prints of Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark the drawing that is most capable of showing conditions fully and accurately. Where Shop Drawings are used, record a cross-reference at the corresponding location on the Drawings. Provide detailed and accurate field dimensions for concealed elements that would be difficult to measure and record at a later date.
  - 1. Mark record sets with red erasable pencil or red linework if marking digitally. Use other colors to distinguish between variations in separate categories of the Work. Date and number entries in the same format as submitted. Call attention to entry by a "cloud" around the affected areas.
  - 2. Mark new information important to Owner but was not shown on Drawings or Shop Drawings.
  - 3. Utility location and depth below finished grade and above ceilings and attic spaces shall be fully dimensioned and indicated on record drawings. Dimensions shall be measured from building lines or permanent landmarks and shall be triangulated to those features.
  - 4. Note related Change Order or Construction Directive numbers where applicable. Request for Clarification (RFC) submissions shall be referenced on each affected sheet, Drawing and Shop Drawing.
  - 5. Organize record drawing sheets into manageable sets. Bind sets with durable-paper cover sheets; print suitable titles, dates, and other identification on the cover of each set.
  - 6. Prior to Contract Completion of the Work, submit final project record drawings in both native CAD/BIM format and PDF. Files shall be clearly labeled 'As-Built Drawings,' dated, and signed by the Contractor. Provide one electronic copy on secure media (cloud delivery, flash drive, or as directed) and one printed record set on bond paper. Digital record drawings shall include all revisions, field changes, and approved modifications.
- C. Record Specifications: Maintain two complete copies of the Specifications, including Addenda. Include with the Specifications two copies of other written Contract Documents, such as Change Orders or Construction Directives issued during construction.
  - 1. Mark these record documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications.
  - 2. Give particular attention to substitutions and selection of options and information on concealed Work that cannot otherwise be readily discerned later by direct observation.
  - 3. Note related record document information with Product Data.
  - 4. Prior to Contract Completion of the work, submit record Specifications to Architect for Owner records in format approved by Owner.
- D. Record Product Data: Maintain two copies of each Product Data submittal. Note related Change Orders and Construction Directives and mark-up of record drawings and Specifications.
  - 1. Mark these documents to illustrate significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the Project site and from the manufacturer's installation instructions and recommendations.

2. Provide detailed and accurate information regarding concealed products and portions of Work that cannot otherwise be readily discerned later by direct observation.
3. Prior to Contract Completion, submit complete set of record Product Data to Architect for Owner records in format approved by Owner.
- E. Record Samples: Immediately prior to Substantial Completion, Contractor shall meet with Architect and OAR at the Project site to determine which Samples are to be transmitted to Owner for record purposes. Comply with OAR instructions regarding delivery to Owner storage area.
- F. Miscellaneous Records: Refer to other Specification sections for requirements of miscellaneous record keeping and submittals in connection with actual performance of the Work. Prior to the date of Contract Completion, complete and compile miscellaneous records and place in good order. Identify miscellaneous records properly and bind or file, ready for continued use and reference. Submit to Architect for Owner records in format approved by Owner.
- G. Maintenance Manuals: Prior to Substantial Completion, organize operation and maintenance data into suitable two printed sets of manageable size and one searchable electronic PDF. Bind properly indexed data in individual, heavy-duty, two to three-inch 3-ring, vinyl-covered binders, with pocket folders for folded sheet information. Mark appropriate identification on front and spine of each binder. Submit to Architect for Owner records. Include the following types of information.
  1. Emergency instructions.
  2. Spare parts list.
  3. Copies of warranties.
  4. Wiring diagrams.
  5. Recommended "turn-around" cycles.
  6. Inspection procedures.
  7. Shop Drawings and Product Data.
  8. Fixture lamping schedule.

**3.04 OPERATION AND MAINTENANCE:**

- A. Operation and Maintenance Instructions: Prior to Substantial Completion, arrange for each installer of equipment that requires regular operation and maintenance to meet with designated Owner personnel to provide instruction in proper operation and maintenance. Provide instruction by manufacturer's representatives if installers are not experienced in operation and maintenance procedures. Include a detailed review of the following items:
  1. Maintenance manuals.
  2. Spare parts and materials.
  3. Tools.
  4. Lubricants.
  5. Fuels.
  6. Identification systems.
  7. Control sequences.
  8. Hazards.
  9. Cleaning.
  10. Warranties and bonds.
  11. Maintenance agreements and similar continuing commitments.
- B. As part of the instruction for operating equipment, demonstrate the following procedures:
  1. Start-up.
  2. Shutdown.



**SECTION 01 77 00  
CONTRACT CLOSEOUT**

**DIVISION 01**

3. Emergency operations.
  4. Noise and vibration adjustments.
  5. Safety procedures.
  6. Economy and efficiency adjustments.
  7. Effective energy utilization.
- C. If applicable, Notice of Termination: Contractor shall submit a Notice of Termination (NOT) to the local Regional Water Quality Control Board, RWQCB. Provide a copy of NOT to OAR.

**3.05 FINAL CLEANING**

- A. General: Related sections of the Contract Documents specify general cleaning during performance of the Work. General cleaning is included in 01 50 00 - Temporary Facilities and Controls.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.
1. Complete the following cleaning operations before requesting inspection for a certificate of Substantial Completion.
    - a. Remove labels that are not permanent labels.
    - b. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other substances that are noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.
    - c. Clean exposed exterior and interior hard-surfaced finished to a dust-free condition, free of stains, films, and similar foreign substances. Restore reflective surfaces to their original condition. Leave concrete floors broom clean. Vacuum carpeted surfaces.
    - d. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.
    - e. Clean the Project site, including landscape development areas, of rubbish, litter, and other foreign substances. Sweep paved areas, broom clean; remove stains, spills, and other foreign deposits. Rake grounds that are neither paved nor planted to a smooth, even-textured surface.

**END OF SECTION**



**SECTION 01 78 36  
WARRANTIES**

**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. This Section includes administrative and procedural requirements for warranties, including manufacturers' and installers' standard warranties on products and special product warranties.
  - 1. Refer to the General Conditions for the terms of the guarantee period for the Work.
- B. For Owner-furnished, Contractor-installed material or equipment, Contractor shall be treated as Contractor-furnished and installed until it is determined to the satisfaction of all parties the defect(s) at issue are wholly due to the manufacturer and are not attributable in whole or in part to the Contractor's handling or installation after taking possession of the material or equipment in question.

**1.02 RELATED REQUIREMENTS**

- A. Section 01 60 00 - Products, Materials, Equipment, and Substitutions.
- B. Section 01 73 29 - Cutting and Patching.
- C. Section 01 77 00 - Contract Closeout.

**1.03 SUBMITTALS**

- A. Submit written preliminary warranties prior to Substantial Completion and final warranties prior to Contract Completion. If the certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, submit written warranties as set forth in the certificate of Substantial Completion.
  - 1. When a designated portion of the Work is partially used and/or occupied by Owner, submit properly executed warranties to Architect within fifteen days of the Partial Use or Occupancy of the designated portion of the Work.
- B. When the Contract Documents require Contractor, or Contractor and a Subcontractor, installer, supplier or manufacturer to execute a special warranty, prepare a written document containing appropriate terms and identification, ready for execution by the required parties. Submit a draft to OAR, through the Architect, for approval prior to final execution.
  - 1. Refer to Divisions 02 through 49 for specific content requirements and particular requirements for submitting special warranties.
- C. Form of Submittal: Prior to Contract Completion, compile two copies of each required final warranty properly executed by Contractor, or by Contractor and Subcontractor, installer, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the Specifications. The documents shall also be provided as a digital PDF file.
- D. Bind warranties and bonds in heavy-duty, commercial-quality, durable three-ring, vinyl-covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8½ by 11 paper.
  - 1. Provide heavy paper dividers with celluloid-covered tabs for each separate warranty. Mark the tab to identify the item or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address, and telephone number of the installer.
  - 2. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project title and/or name, and name of Contractor.
  - 3. When warranted work requires operation and maintenance manuals, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

**PART 2 - PRODUCTS (NOT APPLICABLE)**

**PART 3 - EXECUTION**

**3.01 WARRANTY REQUIREMENTS**

- A. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties shall not relieve Contractor of the warranty of the Work incorporating such materials, products, and equipment. Manufacturer's disclaimers and limitations on warranties do not relieve suppliers, manufacturers, installers, and Subcontractors of the requirement to countersign special warranties with the Contractor.
- B. Standard warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to Owner.
- C. Special warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for Owner.
- D. Related Damages and Losses: When correcting failed or defective warranted Work, remove and replace Work that has been damaged as a result of such failure or which must be removed and replaced to provide access for correction of warranted Work.
- E. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement with the reinstated warranty equal to the original warranty.
- F. Replacement Cost: Upon determination the Work covered by a warranty has failed and/or is defective, replace or rebuild the Work to an acceptable condition complying with requirements of the Contract Documents. Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether Owner has benefited from use of the Work through a portion of its anticipated useful service life.
- G. Owner Recourse: Expressed warranties made to Owner are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under the law. Expressed warranty periods shall not be interpreted as limitations on the time in which Owner can enforce such other duties, obligations, rights, or remedies.
- H. Rejection of Warranties: OAR reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
- I. Where the Contract Documents require a special warranty, or similar commitment on the Work or part of the Work, OAR reserves the right to refuse to accept the Work until Contractor presents evidence the entities required to countersign such commitments have done so.

**END OF SECTION**

**SECTION 01 81 13  
SUSTAINABLE DESIGN REQUIREMENTS**

**PART 1 – GENERAL**

**1.1 SUMMARY**

- A. General: Provide Sustainable Design in accordance with requirements of the Contract Documents.

**1.2 REFERENCES**

- A. General: Comply with the applicable provisions of the referenced standards except as modified by governing codes and the Contract Documents. Where a recommendation or suggestion occurs in the referenced standards, such recommendation or suggestion shall be considered mandatory. In the event of conflict between referenced standards, this specification or within themselves, the more stringent standard or requirement shall govern.
1. City of Goleta Green Building Program
  2. American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE)
  3. American Society of Mechanical Engineers (ASME)
  4. Environmental Protection Agency (EPA)
  5. Forest Stewardship Council (FSC)
  6. Illuminating Engineering Society of North America (IESNA)
  7. Sheet Metal and Air Conditioning National Contractor Association (SMACNA)

**1.3 PERFORMANCE REQUIREMENTS**

- A. In addition to the performance requirements below, provide additional Sustainable Design Performance Requirements as specified in individual Division 02-49 technical Sections.
- B. Site Location
1. Replace existing trees over 6 inches in diameter that are removed for development with minimum 24 inch box planted in the ground, as designed.
  2. Provide drought tolerant and native species for landscaping as designed and specified in Landscape Drawings
  3. Provide water-efficient irrigation system.
  4. Provide secure bicycle parking, as designed.
  5. Provide permeable surfaces where indicated on drawings



**SECTION 01 81 13  
SUSTAINABLE DESIGN  
REQUIREMENTS**

**DIVISION 01**

6. Provide space for the collection and storage of recyclables, as designed.
- C. Plumbing
1. Insulate the full length of all hot water pipes specified in Division 22 plumbing specification Sections.
  2. Provide Water efficient fixtures with flow rates compliant with CalGreen and values listed in A050 Series
- D. Insulation
1. Provide formaldehyde-free, recycled content insulation with a minimum 25% recycled content for insulation specified in Section 07 23 00 "Building Insulation".
- E. Energy Efficiency and Renewable Energy
1. Provide Energy Star appliances.
  2. Provide Energy Star lighting fixtures for 50% of total fixtures as specified in Drawings.
  3. Provide Energy Star programmable thermostats as specified in Division 23 mechanical specification sections.
  4. Provide timer or photo sensor for exterior lights specified in Section 26 56 00 "Exterior Lighting".
  5. Install and seal ducts per SMACNA recommendations and as specified in Division 23 mechanical specification sections.
- F. Indoor Air Quality
1. Provide no-VOC paints on interior applications (less than or equal to 5 g/l) as specified in Section 09 91 00 "Painting".
  2. Provide low-VOC sealants and adhesives (less than or equal to 50 g/l) as specified in Section 07 92 00 "Joint Sealants", Section 09 21 17 "Gypsum Board Systems", Section 09 65 00 "Resilient Flooring", and Section 09 68 00 "Carpeting".
  3. For counters and cabinets specified in Section 06 40 00 "Architectural Woodwork", provide composite wood products containing no-added urea formaldehyde.
  4. Provide high efficiency HVAC filters as specified in Division 23 mechanical specification sections.
  5. Create construction IAQ plan compliant with CalGreen and submit for Architect's information. Keep a printed copy posted on the jobsite.

**G. Roofing**

1. Provide recycled-content roofing materials as specified in Section 07 54 00 "Thermoplastic Membrane Roofing".
2. Provide Energy Star or Cool Roof system as specified in Section 07 54 00 "Thermoplastic Membrane Roofing".
3. Provide durable roof system with long-term warranty or demonstrated long-term durability (15 year warranty) as specified in Section 07 54 00 "Thermoplastic Membrane Roofing".

**H. Interior Finishes**

1. Provide resource-efficient flooring or FSC-Certified wood flooring for all wood flooring, recycled-content carpet, or flooring tiles with a minimum of 25% recycled content as specified in Sections 09 64 00 "Wood Flooring", Section 09 65 00 "Resilient Flooring", and Section 09 68 00 "Carpeting". Resource efficient includes rapidly renewable materials,
2. Cabinetry shall be made from FSC certified or rapidly renewable materials as specified in Section 06 40 00 "Architectural Woodwork".

**I. Construction Methods**

1. Divert a minimum of 80% of construction and demolition waste from landfills in accordance with Department of Public Works standards.
2. Label storm drains in the public right-of-way adjacent to the project site in accordance with Department of Public Works standards.
3. Provide a conduit from the roof to the electrical room to accommodate future photovoltaic system installation (as designed).
4. Provide a Construction Storm Water Management Plan.
5. Provide a Construction Air Quality Management Plan, that at a minimum, protects ducts during construction and changes filters and vacuum ducts prior to occupancy.
6. Provide infiltration, biofiltration, or equivalent flow reduction treatment BMP for the runoff resulting from either the first 0.75 inches of rainfall or the runoff resulting from a continuous rainfall event of 0.2 inches per hour.
7. Comply with applicable requirements of Chapter 10.16 on Transportation Demand Management of the Municipal Code.

**1.4 SUBMITTALS**

- A. In addition to the submittals below, provide additional Sustainable Design Submittals as specified in individual Division 02-49 technical Sections.

- B. Site Location Submittals: Submit for Architect's information.
  - 1. Product Data: Cut Sheet or written affidavit from the manufacturer indicating the recycled content of mulch or other landscape products.
- C. Structural Frame Submittals: Submit for Architect's information.
  - 1. Product Data: Cut Sheet(s) for engineered lumber or steel materials used for structural frame.
- D. Energy Efficiency + Renewable Energy Submittals: Submit for Architect's information.
  - 1. Certificates: From manufacturer(s) of appliances, lighting fixtures, timers, and photo sensors indicating compliance with Energy Star programs.
- E. Roofing Submittals: Submit for Architect's information.
  - 1. Roof Warranty
- F. Interior Finish Submittals: Submit for Architect's information.
  - 1. Certificate(s): FSC Certification for interior wood flooring and cabinetry materials.
- G. Waste Management Submittals: Submit for Architect's information.
  - 1. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit Waste Reduction Progress Reports. Include separate reports for demolition and construction waste. Include the following information:
    - a. Material category.
    - b. Generation point of waste.
    - c. Total quantity of waste in tons.
    - d. Quantity of waste salvaged, both estimated and actual in tons.
    - e. Quantity of waste recycled, both estimated and actual in tons.
    - f. Total quantity of waste recovered (salvaged plus recycled) in tons.
    - g. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
  - 2. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
  - 3. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

4. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
  5. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
  6. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
  7. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.
- H. Construction Air Quality Management Plan: Submit for Architect's information.
1. Management Plan: Not more than 60 days after award of Contract, prepare and submit a Management Plan including, but not limited to, the following:
    - a. Procedures for control of emissions during construction.
      - 1) Identify schedule for application of interior finishes.
    - b. Procedures for moisture control during construction.
      - 1) Identify porous materials and absorptive materials.
    - c. Identify schedule for inspection of stored and installed absorptive materials.
    - d. Revise and resubmit Plan as required by Owner.
      - 1) Approval of Contractor's Plan will not relieve the Contractor of responsibility for compliance with applicable environmental regulations.
    - e. Final Construction Air Quality Report: After completion of Construction and prior to substantial completion submit a "Final Construction Air Quality Report" for flushout and testing.
  2. Product Data
    - a. Submit product data for filtration media used during construction and during operation. Include Minimum Efficiency Reporting Value (MERV).
    - b. Submit air pressure difference maps for each mode of operation of HVAC.

- c. Material Safety Data Sheets: Submit MSDSs for inclusion in Operation and Maintenance Manual for the following products:
  - 1) Adhesives.
  - 2) Floor and wall patching/leveling materials.
  - 3) Sealants.
  - 4) Insulating materials.
  - 5) Fireproofing and firestopping.
  - 6) Carpet.
  - 7) Paint, coatings and sealers.
  - 8) Clear finish for wood surfaces.
  - 9) Lubricants.
  - 10) Cleaning products.
- 3. Inspection and Test Reports: Submit for Sustainable Design Consultant's Information
  - a. Moisture control inspections.
  - b. Moisture content testing.
  - c. Moisture penetration testing.
  - d. Microbial Growth testing.
  - e. Replacement Filter Type Submittals: Submit for Architect's Information: Submit filter replacement plan and confirmation of filter replacements in the form of Contractor maintenance logs detailing that filters were replaced during post-construction, and pre-occupancy.
- I. Green Features/Benefits Manual: Provide Owner with a Green Features/Benefits manual.

## **1.5 QUALITY CONTROL**

- A. Contractor's Quality Control Responsibilities: Contractor is solely responsible for quality control of the Work.
- B. Contractor's Sustainable Design Representative: Designate a Representative of the Contractor's team who shall oversee the environmental goals for the project, shall instruct workers concerning these goals, and shall be present on site when Work is in progress.





**SECTION 01 81 13  
SUSTAINABLE DESIGN  
REQUIREMENTS**

**DIVISION 01**

- C. Sustainable Design Meetings: Schedule and conduct sustainable design meetings monthly, in addition to those outlined in Section 01 31 00 "Project Management and Coordination". Meeting attendees shall include at least the following: Owner's Representative, Architect, Contractor's Project Manager, Contractor's Sustainable Design Representative, and Sub-Contractor Representatives as appropriate to stage Work. Discuss Sustainable Design initiatives at Pre-bid, Pre-construction, and regular job site meetings.
- D. Sustainable Design Training Program: Provide environmental training for workers performing Work on the Project site. Training shall include the following:
  - 1. Overview of environmental issues related to the building industry.
  - 2. Specific sustainable design requirements for this project.
- E. Regulatory Requirements: Comply with applicable requirements of laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from authorities having jurisdiction.

**PART 2 – PRODUCTS (NOT USED)**

**PART 3 – EXECUTION (NOT USED)**

**END OF SECTION**

**SECTION 02 26 01  
REMOVAL AND DISPOSAL OF HAZARDOUS SUBSTANCES**

**PART I - GENERAL**

**1.01 REFERENCE STANDARDS**

- A. 29 CFR 1910 - Occupational Safety and Health Standards; Current Edition.
- B. 29 CFR 1910.134 - Respiratory protection; Current Edition.
- C. 29 CFR 1910.146 - Permit-Required Confined Spaces; Current Edition.
- D. 29 CFR 1926 - Safety and Health Regulations for Construction; Current Edition.
- E. 29 CFR 1926.62 - Lead; current edition.
- F. 29 CFR 1926.1101 - Asbestos; Current Edition.
- G. 40 CFR 261 - Identification and Listing of Hazardous Waste; Current Edition.
- H. 40 CFR 280 - Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks; current edition.
- I. ASTM INTERNATIONAL (ASTM): ASTMD5434 Standard Guide for Field Logging of Subsurface Explorations of Soil and Rock
- J. 40 CFR 262 - Standards Applicable to Generators of Hazardous Waste
- K. 40 CFR 264 - Standards for Land Operators of Hazardous Waste
  - 1. Treatment, Storage, and Disposal Facilities
- L. 40 CFR 268 Land Disposal Restrictions
- M. Cal/OSHA California Code of Regulations (CCR):
  - 1. Title 8, Section 1529; Asbestos Standards in Construction
  - 2. Title 8, Section 5208; Asbestos Standards in General Industry
  - 3. Title 8, Section 5208.1; General Industry Standard relating to Non-Asbestiform Tremolite, Anthophyllite, and Actinolite3. Title 8, Section 5208.1; General
  - 4. Title 8 1532.1; Construction Safety Orders, Lead
  - 5. Title 8 17 Div 1, Ch 8; Accreditation, Certification, and Work Practices for Lead-Based Paint and Lead Hazards
  - 6. Title 8 5144; Respirator Protection
  - 7. Title 8 5194; Hazard Communication
  - 8. Title 22; Department of Toxic Substances Control (DTSC)
- N. Santa Barbara County Air Pollution Control District Regulations (CCR):
  - 1. Title 17, Section 93105; Asbestos Air Toxic Control Measures (ATCM) for Construction, Grading, Quarrying and Surface Mining Operations
  - 2. Notification for Renovation and Demolition; ENF-28
- O. State, County, and City Codes and Ordinances as applicable

**1.02 SUMMARY**

- A. Description:
  - 1. This Section includes excavating, dewatering, handling, stockpiling, temporarily storing, and/or disposing of existing hazardous and contaminated materials that are known or that may be encountered during the Work.
  - 2. This Section includes preparation of plans to manage contaminated materials including those defined in General Conditions requirements.
  - 3. This Section also includes procedures applicable to the Contractor's generation, use, and/or release of hazardous or contaminated substances in the course of the Contractor's operation, for which the Contractor is responsible under the General Conditions



**SECTION 022601  
REMOVAL AND DISPOSAL  
OF HAZARDOUS  
SUBSTANCES**

**DIVISION 02**

requirements. Complete the removal of lead-containing materials, asbestos, polychlorinated biphenyls (PCB) articles, and underground storage tanks.

- B. Section Includes:
  - 1. Contractor's Assistance
  - 2. Existing Structures and Utilities
  - 3. Contaminated Material Removal
  - 4. Sampling and Analysis
  - 5. Contaminated Material Staging
  - 6. Spills
  - 7. Backfill
  - 8. Off-Site Disposal

**1.03 RELATED CONTRACT DOCUMENTS**

- A. Section 02 41 00 - Demolition
- B. Section 31 10 00 - Site Clearing
- C. Section 31 22 00 - Grading

**1.04 DEFINITIONS**

- A. Hazardous substance- means any substance designated or listed under paragraphs 1 through 4 of this definition, exposure to which results or may result in adverse affects on the health or safety of employees:
  - 1. Any substance defined under CERCLA 42 U.S.C. § 9601(14);
  - 2. Any biological agent and other disease-causing agent which after release into the environment and upon exposure, ingestion, inhalation, or assimilation into any person, either directly from the environment or indirectly by ingestion through food chains, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions (including malfunctions in reproduction) or physical deformations in such persons or their offspring;
  - 3. Any substance listed by the U.S. Department of Transportation as hazardous materials under 49 CFR 172.101 and appendices; and
  - 4. Hazardous waste as herein defined.
- B. Hazardous waste means:
  - 1. A waste or combination of wastes as defined in 40 CFR 261.3, or
  - 2. Those substances defined as hazardous wastes in 49 CFR 171.8.
  - 3. Hazardous waste having the characteristics identified under or listed pursuant to section 3001 of the Resource Conservation and Recovery Act of 1976 (RCRA), as
    - a. amended, (42 U.S.C. § 6921) (but not including any waste the regulation of which under RCRA (42 U.S.C. § 6901 et seq.) has been suspended by Act of Congress), any toxic pollutant listed under section 1317(a) of Title 33, any hazardous air pollutant listed under section 112 of the Clean Air Act (42 U.S.C. § 7412), and any imminently hazardous chemical substance or mixture with respect to which the Administrator (ofEPA) has taken action pursuant to section 2606 of Title 15

**1.05 GENERAL REQUIREMENTS**

- A. During construction, existing potentially hazardous substances may be encountered. These conditions may require the excavation, handling, stockpiling, temporary storing, and disposal of hazardous substances. Perform remediation and other tasks of this Section at the direction of Owner, in compliance with applicable statutes and regulations.
- B. Potential hazardous substances that may be encountered include, but are not limited to, asbestos, lead, total petroleum hydrocarbons (TPH), gasoline, diesel, and oil-range; metals; polynuclear aromatic hydrocarbons (PAHs); polychlorinated biphenyls (PCB); and volatile



**SECTION 022601  
REMOVAL AND DISPOSAL  
OF HAZARDOUS  
SUBSTANCES**

**DIVISION 02**

organic compounds (VOCs), such as benzene, toluene, ethylbenzene, xylenes (BTEX); perchloroethene (PCE), trichloroethene (TCE), and vinyl chloride. Some of these substances and locations where there is a greater likelihood of impacted materials are discussed in the Hazardous Materials Technical Report (DTS 2008).

- C. Conduct the work of this Section in accordance with Contract requirements; direction received from Owner; the accepted plans for managing hazardous substances; and applicable federal, state, and local statutes, regulations, and standards.
- D. Obtain all required permits and notifications for removal (excavation/dewatering), storage, transportation, and disposal of hazardous substances. In furtherance of this requirement, Owner will provide the Contractor with sampling results, if any, and other information developed by Owner, if any. Permits shall be obtained at no additional cost to Owner.
- E. Implement the water discharge requirements set forth in the General Conditions.

**1.06 SUBMITTALS**

- A. Refer to submittals in Section 01 33 00 - Submittal Procedures.

**PART 2 - PRODUCTS**

**2.01 SPILL RESPONSE MATERIALS**

- A. Provide spill response materials, including but not limited to containers, adsorbents, shovels, and personnel protective equipment. Spill response materials shall be available at all times when hazardous materials/wastes are being handled or transported. Spill response materials shall be compatible with the type of materials and contaminants being handled.

**2.02 STAGING MATERIAL**

- A. Geomembranes to be used as liner or material cover shall be chemical resistant with minimum thickness of 10 mils.

**PART 3 - EXECUTION**

**3.01 CONTRACTOR'S ASSISTANCE**

- A. Assist Owner in performing general excavation and site remediation activities. This includes providing access for Owner to document site activities and collect soil and water samples. Such assistance may also include collecting soil samples with a backhoe at the direction of Owner or an authorized representative. Be aware and anticipate that a reasonable time will elapse between collecting confirmation samples and completing chemical laboratory analyses, and secure and maintain excavation areas during that time. Such assistance may also include attendance at regular project meetings.
- B. Assist Owner in the duties specified under the General Conditions. Such assistance includes providing access to sampling sites so that Owner may monitor discharges. Monitoring may be required under applicable permits.
- C. Provide access for City representatives to conduct its own testing and monitoring at its sole discretion to satisfy itself regarding compliance with regulatory or permit requirements. Inspection, monitoring, and testing by Owner does not relieve the Contractor of responsibility for compliance.

**3.02 EXISTING STRUCTURES AND UTILITIES**

- A. Take necessary precautions to avoid damage to existing structures, their appurtenances, monitoring wells, or utilities that may be affected by work activities. Coordinate with Owner and/or property s to locate underground utilities prior to beginning construction. Utilities encountered that were not previously shown or otherwise located shall not be disturbed without approval from the property or Owner.
- B. Repair damage to existing site features to be protected at no additional cost to Owner.



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**3.03 HAZARDOUS SUBSTANCE REMOVAL**

- A. Unless directed otherwise by Owner, give notification at least 7 calendar days prior to the start of excavation of known contaminated material. Unless otherwise directed by Owner, be responsible for contacting regulatory agencies in accordance with applicable reporting requirements. Notification is to include the type of materials being removed, the levels of contamination, and the destination/final disposal site of the material.
- B. Strip and stockpile "clean" material separately from contaminated material. Segregate potentially contaminated material into material that exceeds field screening levels and material that does not exceed these levels. Be responsible for protecting "clean" material from becoming contaminated. This may include covering the materials with plastic sheeting. Materials that become contaminated as a result of Contractor activities shall be disposed of at the Contractor's expense.
  - 1. Excavate areas of contamination as directed by Owner and in compliance with State and local jurisdiction landfill requirements. Perform excavation in a manner that will limit the potential for contaminated material to be mixed with uncontaminated material.
- C. Maintain a log of the materials and visible signs of hazardous substances encountered during excavation for each area of excavation. Prepare excavation logs in accordance with ASTM D5434.
- D. Divert surface water to prevent entry into the excavation. Limit dewatering to that necessary to ensure adequate access and a safe excavation, and to ensure that compaction requirements can be met.
- E. Perform field surveys immediately prior to and after excavations of contaminated material to determine the volume of contaminated material removed. Provide cross-sections on 10-foot intervals and at obvious break points for excavated areas. Survey the locations of confirmation samples. Perform surveys using tape and compass methods.
- F. Contain contaminated water and store on site in accordance with applicable federal, state, and local disposal regulations until analytical results are obtained. Analyses for contaminated water to be taken to an off-site treatment facility shall conform to the requirements of the treatment facility. Analyses for storm drain or sanitary sewers shall be as specified in the General Conditions.
- G. Provide the approved containers, vehicles, equipment, labor, signs, labels, placards and manifests, and associated disposal notices and notifications necessary for accomplishing the Work.
- H. Provide documentation of proper disposal or treatment to Owner.

**3.04 SAMPLING AND ANALYSIS**

**3.05 OWNER HAZARDOUS SUBSTANCE MATERIAL STAGING**

- A. Place material containing hazardous substances (herein referred to as contaminated material) in a staging unit immediately after excavation while awaiting test results. This Article describes acceptable methods of material staging. Staging units shall be in good condition and constructed of materials that are compatible with the material or liquid to be staged. If multiple staging units are required, clearly label each unit with an identification number and keep a written log to track the source of contaminated material in each staging unit.
- B. Isolate confirmed and/or suspected contaminated material from the environment. The maximum stockpile size shall be 100 cubic yards. Stockpiles shall be constructed to include:
  - 1. A chemically resistant geomembrane liner. The ground surface on which the geomembrane is to be placed shall be free of rocks greater than 0.5 inch in diameter and other objects that could damage the membrane.



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2. Geomembrane cover to prevent precipitation from entering the stockpile. The cover material shall be anchored to prevent it from being removed by wind.
  3. Berms surrounding the stockpile shall be a minimum of 12 inches high. Vehicle access points shall also be bermed.
  4. Liquid collected from excavations and stockpiles shall be temporarily stored in 55-gallon barrels or portable tanks. Liquid storage containers shall be watertight.
- C. Watertight roll-off units lined with 10-mil plastic sheeting may be used to stage contaminated material. Place an impermeable cover over the units to prevent precipitation from contacting the stored material. Remove and store liquid that collects inside the units.

**3.06 SPILLS**

- A. In the event of a Contractor spill or release of a hazardous substance, as defined in the General Conditions requirements, notify Owner immediately. If the spill exceeds the regulatory reporting threshold, follow the pre-established procedures described in the HSHSP (described in Section 01 74 20 - Discovery and Assessment of Suspect and Confirmed Hazardous Substances) for immediate reporting and containment. Take immediate containment actions to minimize the effect of spills or leaks. Perform cleanup in accordance with applicable federal, state, and local regulations. As directed by Owner, perform additional sampling and testing to verify spills have been cleaned up. Perform cleanup and testing of spills resulting from the negligent actions of the Contractor at no additional cost to Owner.

**3.07 BACKFILL**

- A. Backfill excavations only after confirmation sample test results have been received and/or upon Owner's direction. Contaminated material removal shall be considered complete after the bottom of the excavation is determined to have soil contamination levels below applicable state cleanup standards, and/or at Owner's direction. Excavation shall be dewatered if necessary. Stockpiled material that was sampled for testing shall be used as backfill if it is found to conform to the requirements of clean fill in accordance with Section 31 23 13 - Earth Moving. Place and compact backfill in accordance with Section 31 23 13 - Earth Moving.

**3.08 OFF-SITE DISPOSAL**

- A. Load contaminated material for off-site disposal. Costs associated with this task shall be included in the unit price for material handling and disposal.
- B. Provide transportation in accordance with hazardous substance regulations and federal, state, and local requirements, including obtaining necessary permits, licenses, and approvals. In submittals, include evidence that a state-licensed transporter is being used. The contaminated material may be shipped by truck, ship, or rail. Provide coordination of all activities. Double-line the bed of the truck or rail car with 6-mil plastic sheeting for each load. Subsequently, cover each load with plastic sheeting and tarpaulin prior to leaving the site.
- C. Treatment, Disposal, and Recycling:
1. Perform treatment, disposal, and recycling of contaminated materials in accordance with all applicable laws, regulations, and conditions specified herein. This work shall include all necessary personnel, labor, transportation, packaging, equipment, and reports.
  2. Where approved by governmental requirements, contaminated material can be treated or landfilled.
  3. If treated, transport contaminated material to a local licensed facility in accordance with applicable requirements.
  4. If landfilled, dispose of contaminated materials in a landfill licensed to receive the material, in accordance with applicable requirements.
- D. Records: Maintain records of all waste determinations, including appropriate results of analyses performed, substances and sample location, the time of collection, and other pertinent data as required by 40 CFR 280 Section 74 and 40 CFR 262 Subpart D, and other applicable





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regulations. Record and make available for inspection the following: transportation, treatment, disposal methods and dates, quantities of waste, names and addresses of each transporter, and disposal or reclamation facility. Also make copies of the following documents available:

1. Manifests.
  2. Waste analyses or waste profile sheets.
  3. Certifications of final treatment/disposal signed by the responsible disposal facility official.
  4. Land disposal notification records required under 40 CFR 268 for hazardous wastes.
  5. Records shall be provided in accordance with applicable federal, state, and local regulations. Following Contract closeout, records shall become Owner's property.
- E. Manifesting of hazardous waste shall conform to EPA, DOT, and all other applicable federal, state, and local regulations. For disposal of all hazardous waste (with the exception of wastes resulting from the release of hazardous or contaminated substances negligently disturbed, removed, or handled by the Contractor, its employees, agents, officers, or subcontractors, or any other persons for whom the Contractor may be contractually or legally responsible), the Generator's Certification portion of the Uniform Hazardous Waste Manifest shall be signed only by Owner's Hazardous Materials Coordinator or by an individual delegated with such authority by Owner (Owner's Representative).
- F. Documentation of Treatment or Disposal:
1. Transfer wastes, other than recyclable or reclaimable product or metal, to a treatment, storage, or disposal facility which has EPA or appropriate state permits and hazardous or special waste identification numbers and complies with the provisions of the disposal regulations.
  2. Furnish to Owner the original return copy of the hazardous waste manifest, signed by the operator of a facility legally permitted to treat or dispose of those materials furnished, not later than 5 working days following the delivery of those materials to the facility.
  3. Furnish a statement of agreement from the proposed treatment, storage or disposal facility and certified transporters to accept hazardous or special wastes.

**3.09 ASBESTOS REMOVAL SUMMARY OF WORK**

- A. Work Included:
1. The asbestos materials to be removed and disposed of are detailed in the asbestos survey entitled, *"Asbestos Survey and Hazardous Materials Inspection, Goleta Train Depot, 27 South La Patera Lane, Goleta, California, 93117"* by All Phase Environmental, Inc. dated December 6, 2023.
  2. Contractor shall verify actual quantities present and shall not rely on the quantities described in the asbestos survey.
  3. Contractor shall establish work area containment(s) and remove asbestos-containing materials utilizing the required engineering controls and personal protective equipment (PPE). The Contractor shall decontaminate work area containments and dispose of ACM waste.
  4. Contractor shall be responsible for performing personnel air monitoring and analysis.
  5. The Contractor is hereby advised that asbestos has been determined by the U.S. Government to be a CANCER CAUSING AGENT and Contractor shall provide workers with respirators which, at a minimum, shall meet the requirements of OSHA 29 CFR 1910.134 and protective clothing during establishment of work area containment, prior to commencing asbestos removal, during actual asbestos removal, and until results of satisfactory final air tests are accepted by Owner's Representative.
  6. Contractor shall leave the work area in a condition ready for renovation by others.
- B. Work Not Included:
1. Daily and clearance ACM air monitoring will be performed by the Owner's Representative.
  2. Replacement or reinstallation of materials removed during abatement.



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**C. Work Plan and Schedule:**

1. The Contractor shall prepare a detailed plan of the work procedures to be used, the method(s) of area isolation and fiber control, locations of decontamination units and HEPA exhausts, and the storage of wastes. This plan shall also include a schedule of on-site activities indicating when asbestos removal will be conducted to include the start and completion dates. The schedule must state when each phase of work is anticipated to begin and end. The Contractor shall notify the Owner's Representative a minimum of 72 hours prior to changing the schedule.
2. Work shall be conducted in one 8 hour shift Monday through Friday between 6:00 am to 6:00 pm unless specifically authorized by the Owner.

**D. Notifications:**

1. The Contractor shall prepare and submit in writing, on behalf of Owner, a 10- working day notification of impending commencement of asbestos removal activities to the Santa Barbara County Air Pollution Control District (APCD) as required on the Notification Form ENF-28. The Contractor shall also provide the Owner and the APCD at least 10 business days' notice prior to the start of work.
2. The Contractor shall be responsible for timely payment of the applicable abatement notification fees and all permits, as required; and, for timely revision of the notice as needed over the course of the Work.

**E. Submittals:**

1. The Contractor shall provide required submittals in a timely manner and at appropriate times in the execution of the Work to allow for sufficient and prompt review by Owner's Representative, and revise and resubmit as necessary to establish or maintain compliance with the specified requirements.
2. The Contractor shall submit two complete sets of Pre Job Submittals to Owner's Representative for review, prior to the Work. Work may not proceed until the complete Pre Job Submittal package has been reviewed and accepted as complete by the Owner's Representative.
3. The Contractor shall submit documentation specified in this Section for individual workers to the Owner's Representative prior to using those employees on the Work. Workers without documentation shall not be allowed inside the regulated areas until such documentation has been reviewed and accepted by the Owner's Representative.
4. Pre Job Submittals must include the following:
  - a. Copy of the 10-working day notification of impending commencement of asbestos abatement work.
  - b. Copy of the Contractor's asbestos abatement contractor license valid for the period of time covered by the Work.
  - c. Copy of a work plan and schedule describing how the areas will be isolated and the methods that will be used to remove the ACMs. Plans showing bracing; hoists; scaffolding; temporary supports; and visual barriers, if needed.
  - d. Copy of Contractor's insurance certificate showing coverages and insureds as required by the Contract Documents (as provided by the Owner).
  - e. All required licensure, permits, and arrangements for transport and disposal of waste materials, including without limitation:
    - 1) Location, including name and address of operator, of landfill proposed for disposal of asbestos wastes generated by the Work
    - 2) Evidence that the landfill proposed for disposal of asbestos waste generated by the Work is approved by applicable federal, state, and/or local regulatory agencies
    - 3) The name and address of the waste hauler to be used for transportation of asbestos wastes; and





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- 4) evidence that the waste hauler is experienced in the transportation of wastes and possesses applicable license(s) for transport.
  - f. A list of the subcontractors to be utilized during the Work, including the subcontractor's name, address, contact name and phone number and the services they will provide during the Work. Provide copies of licenses for those subcontractors providing a service, which requires state or local licensure (e.g. personnel air monitoring).
  - g. Written descriptions and shop drawings for proposed "non-standard" work practices or work practices that would vary from those specified in this document.
  - h. Listing of the asbestos abatement employees proposed to be used for the Work, including list of supervisory personnel. Documentation for each and every worker and supervisor proposed for use during the Work. No worker shall be allowed into a controlled work area without complete and accepted documentation that shall include, without limitation, the following:
    - 1) Copy of California asbestos worker and supervisor certificates, valid for the period of time covered by the Work
    - 2) Copies of applicable fit-testing records, for each respirator to be worn, valid for the period of time covered by the Work, and;
    - 3) Copies of medical approval forms signed by a doctor for performing asbestos work using respiratory protection.
  - i. Progressive Submittals - Provide at least two copies of the following to the Owner's Representative, for review on the Site, during the course of the Work:
    - 1) Revisions to the 10 working day notification
    - 2) required documentation, as specified previously, for additional workers, as needed, and;
    - 3) Revisions to the Project schedule, including working hours and days.
  - j. Post-Job Submittals-Release of final payment will not be recommended until the complete Post-Job Submittals are reviewed and accepted. Provide at least two copies of the following to the Owner's Representative for review on the Site during the course of the Work:
    - 1) Documentation of waste disposal that includes manifests for transport, receipts from landfill operator acknowledging receipt of asbestos-containing waste. All documentation shall be dated and indicate the quantity of materials delivered, signed by an authorized representative of landfill.
    - 2) An listing of each asbestos abatement employee used on the Work and the exact dates on which he or she was present in the controlled work areas.
    - 3) Employee air monitoring results relative to OSHA exposure limits. Results shall at a minimum include the employee's full name and last four digits of their social security number, the activity monitored, respiratory protection employed, and location where the employee was monitored.
    - 4) Where full containment work areas are employed, documentation recording continuous reduced air pressure maintained in contained work areas, compiled on a daily basis.
- F. Utilities:
- 1. The Owner shall provide water and electrical service as available within reasonable proximity to the Work areas. The Contractor will take precautions to not damage existing utilities and shall be responsible for the costs of replacing utilities damaged during abatement activities. The Contractor should presume that the site will have pressurized water supply and 110 / 115 VAC power source.
  - 2. The Contractor shall provide lighting and extensions of utilities as required during the Work. The Contractor shall remove lighting and extension of utilities at the conclusion of the Work.



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3. The Contractor shall provide a temporary fused disconnect switch at the power source and provide ground fault protection using portable multi-outlet units designed for construction project sites.
4. The Contractor shall install temporary piping and valves necessary to deliver water to the work areas. Source of water and pipe route shall be coordinated with the Owner's Representative. The Contractor shall provide back flow protection at source of connection satisfactory to the Owner as necessary. The Contractor shall coordinate with the Owner's Representative for details of connection to existing source.
5. Work related to temporary lighting, utilities or the extension of existing utilities shall only be conducted by Contractor employees or subcontractors who are trained and licensed as required for the work conducted.

**3.10 ASBESTOS REMOVAL**

- A. Description
  1. The Contractor shall perform the planning, administration, execution, and cleaning necessary to safely remove designated ACM.
  2. Approval of or acceptance by Owner or Owner's Representative of various construction activities or methods proposed by Contractor does not constitute an assumption of liability by Owner, or Owner's Representative for inadequacy or adverse consequences of said activities or methods.
- B. Work Included
  1. The Contractor shall establish work area containments as required by federal, state, and local regulations. The Contractor shall conduct abatement activities in no more than two (2) areas at one time unless otherwise permitted by the Owner's Representative. The Contractor is responsible for performing abatement work in the Phases established by the Owner's Representative.
  2. The Contractor shall remove non-ACM interior finishes and fixtures as needed to access the Work. The Contractor shall alleviate unsafe conditions resulting from the Work by conducting additional removal or temporary improvements as needed.
  3. The Contractor shall clean and decontaminate work area containments as described herein.
  4. The Contractor is responsible for personnel air monitoring and analysis of personnel air samples to comply with applicable federal and state regulations.
  5. The Contractor shall properly dispose of asbestos-containing waste off-site in accordance with applicable state and federal regulations, and as specified herein.
  6. The Contractor shall:
    - a. Maintain an on-site supervisor who shall be able to speak, read, and write English and to effectively communicate with workers
    - b. Provide one experienced job foreman for every ten asbestos abatement workers utilized for the Work. Foreman shall remain inside the contaminated work areas while the Work is in progress, and;
    - c. Use only trained, licensed, and experienced asbestos removal workers to perform the Work.
  7. Results of tests of suspect ACM taken from building surfaces within the scope of this Work have been provided to the Contractor in the aforementioned Asbestos Survey report. Contractor is cautioned that, should interpretations be made, opinions be formed, and conclusions be drawn as a result of examining the test results, those interpretations, opinions, and conclusions will be those made, formed, and drawn solely by Contractor. Inasmuch as randomly and/or arbitrarily selected areas were sampled, Owner and Owner's Representative make no representation, warranty, or guaranty that the conditions indicated by the test reports either are representative of those conditions existing



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throughout the area, or that unforeseen developments may not occur, or that materials other than, or in proportions different from, those indicated may not exist.

8. Personnel Protection
9. The Contractor acknowledges and agrees that Contractor is responsible for enforcing worker protection requirements at least equal to those specified in this Section.
10. Compliance with Cal OSHA requirements, including, but not limited to the provision of a Competent Person and development of Negative Exposure Assessments are the sole responsibility of the Contractor.
11. The Contractor shall provide workers with personally issued and marked respiratory equipment approved by NIOSH for the type of work being performed. Each worker shall be able to show, upon request during the course of work, dated proof of fit testing performed by qualified personnel for each respirator worn.
12. Where respirators with disposable filters are used, the Contractor shall provide sufficient filters for replacement as necessary by the workers, or as required by applicable regulations. Filter cartridges to be used shall be NI 00, PI 00 or RI00 HEPA filters approved by NIOSH for asbestos related work.
13. The Contractor shall provide respiratory protection as needed from the time of the first operation involving contact with ACM until notified by the Owner's Representative and the containment/work area removal is completed.
14. The Contractor shall provide at a minimum half-face respirators for workers during the phases of Work in which asbestos may be disturbed, including, but not limited to: preparation of work areas, removal, cleaning, teardown, and waste handling
15. Regarding personnel air monitoring, Contractor shall:
  - a. Schedule air sampling necessary for demonstrating compliance of Contractor's respiratory protection program with OSHA regulations;
  - b. Ensure that the personnel monitoring strategy employed will result in suitable samples for analysis;
  - c. Post at Work Site daily results of personnel monitoring upon receipt; and
  - d. Provide a copy of the results to the Owner's Representative.
16. The Contractor shall permit no visitors in the work areas after commencement of ACM disturbance or removal, except for governmental inspectors having jurisdiction, or as authorized by Owner or Owner's Representative.
17. The Contractor shall provide workers with sufficient sets of protective disposable clothing, consisting of full body coveralls, head covers, gloves, and foot covers, of sizes to properly fit individual workers.
18. The Contractor shall leave reusable equipment, apparel and protection devices (excluding respirators) in the contaminated equipment room until the end of the ACM removal work, at which time such items shall be disposed of as contaminated waste or decontaminated for reuse.
19. The Contractor shall provide authorized visitors and Owner's Representative with suitable protective disposable clothing, respiratory protection (including suitable replacement filters), headgear, eye protection, footwear and other protective equipment of sizes to properly fit visitors whenever they enter the work area.

**C. Materials**

1. The Contractor shall provide materials as required including but not limited to the following.
  - a. Plastic Sheeting Shall be flame retardant, of the thickness as specified, in sizes to minimize the frequency of joints. Sheeting used for visual barriers shall be entirely opaque.
  - b. Tape Shall be glass fiber reinforced or other type capable of sealing joints of adjacent sheets of plastic and for attachment of plastic sheet to finished or unfinished surfaces under both dry and wet conditions.



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- c. Surfactant (wetting agent) Shall consist of a mixture of commercial surfactant mixed with water according to manufacturer's specifications.
    - d. Sealant (encapsulant) Commercial encapsulant mixed according to manufacturer's specification and approved specifically for use in asbestos contaminated environments. It is the responsibility of Contractor to determine compatibility of the sealant with the materials and conditions.
    - e. Impermeable Containers Shall be suitable to receive and retain ACM or asbestos contaminated materials until disposal at an approved landfill and shall be labeled in accordance with applicable regulations. Containers shall be both air and water tight.
    - f. Warning Labels and Signs Shall be as required by the local regulations and OSHA 29 CFR 1926.1101 and posted in both English and Spanish.
  - 2. Other Materials Provide other materials, such as lumber, nails and hardware, which may be required to construct and dismantle the decontamination systems and the barriers that isolate the work areas.
- D. Tools and equipment
  - 1. Contractor shall provide suitable tools for ACM removal including but not limited to the following:
    - a. Water sprayers - Utilize airless or other low pressure sprayers for amended water (wetting agent/surfactant) application. Pressure washers or sprayers may not be used.
    - b. Airless sprayer - Use airless sprayer of sufficient capacity to apply spray-applied encapsulant in accordance with manufacturer's recommendations.
    - c. Air purifying equipment (for maintaining negative air pressure within the work area if needed) - Shall include HEPA filtration systems. Ensure that no purification equipment exhausts contaminated air from inside the work area into uncontaminated areas.
    - d. Air purifying equipment (for internal re-circulation in the work area) - Shall include HEPA filtration systems. Ensure that no internal air movement system or purification equipment exhausts contaminated air from inside the work area into uncontaminated areas.
    - e. Vacuum equipment (for pre-cleaning and cleaning in the work area) - Shall include HEPA filtration systems for exhaust. The equipment shall be maintained and used in accordance with the manufacturer's specification and meet the requirements of applicable laws and regulations.
    - f. Scaffolding and ladders - Shall be as required to accomplish the specified work and shall meet applicable safety regulations.
    - g. Transportation - As required for loading, temporary storage, transit, and unloading of contaminated waste without exposure to persons or property. Use only enclosed dumpsters, trailers or other transports to haul waste containers to prevent loss or damage of containers in route to landfill.
- E. Work Area Preparation by Contractor
  - 1. Restrict access to Work Area.
  - 2. Verify, lock out and seal HVAC equipment supplying or within work areas with a minimum of two layers of six-mil plastic sheeting, individually applied, during the abatement activities.
  - 3. Verify and lockout electrical power to work areas, though lighting may be maintained where practical. Provide temporary power and lighting as necessary to maintain safe and comfortable work environment.
  - 4. Seal work areas from those in which removal will not occur, with a critical barrier consisting of a minimum two-layers of six-mil plastic sheeting. Seal ceiling, roof, plenum, wall and floor penetrations with critical barriers.

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5. Maintain emergency and fire exits from the work areas, or establish alternative exits satisfactory to local fire officials. Mark fire exits appropriately on work area side.
  6. Construct a decontamination unit in compliance with EPA guidelines concerning number, size and placement of airlocks, etc. Shower in personnel decontamination unit shall open into airlock on both contaminated and uncontaminated sides and shall be equipped with running water. Construct decontamination units of appropriate materials (including plastic sheeting) to provide airtight barriers to allow continuous reduced air pressure to be maintained in work areas. Post OSHA decontamination procedures, in both English and Spanish, in clean room for duration of Project.
  7. If the entry to the decontamination unit opens directly to the exterior of the building, it shall be made of durable materials and have a locking door at the entrance to facilitate securing the work area.
  8. Trap shower waste water using filters having a final filter pore size of not larger than 5.0 micron, and drain into a sanitary sewer. Replace contaminated filters when they become clogged. Dispose of filters as asbestos-contaminated waste.
  9. For full containment work areas, place work areas under reduced air pressure as specified, utilizing HEPA filtration systems which comply with ANSI Z9.2 79, local exhaust ventilation. Submit the proposed route of air filtration exhaust to Owner's Representative for review prior to initiating its use.
  10. Cover floors within the containment where removal will not take place with (if applicable) a minimum of two layers of plastic sheeting.
  11. Ensure that barriers and plastic sheeting enclosures remain effectively sealed and taped for duration of abatement and subsequent cleaning. Repair damaged barriers and remedy defects immediately upon discovery.
  12. Visually inspect work areas at the beginning and end of each work period. Repair damaged barriers and remedy defects immediately upon discovery.
  13. Maintain a sign in/out log, as specified, in the immediate area of the change room to be signed by every person each time upon entering and leaving the work areas.
  14. Place in work areas at least one fire extinguisher with a minimum NFPA rating of 10BC (dry chemical) for every 1,000 square feet, or fraction, of work area.
  15. Notify Owner's Representative for observation of the preparation of work areas prior to disturbance of asbestos-containing material. Prior to notification, complete plasticizing of work area, and construction of the decontamination unit. No removal work can begin until preparations have been observed and accepted by Owner's Representative.
- F. Removal of Asbestos Containing Materials
1. The Contractor shall remove and properly dispose of asbestos-containing materials indicated to be removed in accordance with federal, state, and local laws and regulations or as more stringently specified herein.
  2. For the removal of all the designated ACM, Contractor shall:
    - a. Prepare work area as specified;
    - b. thoroughly wet the ACM to be removed with amended water prior to handling, stripping or tooling to reduce fiber dispersal into the air;
      - 1) Accomplish wetting by a fine mist of amended water;
      - 2) Saturate materials sufficiently to wet the substrate without causing excess dripping. Allow time for water to penetrate materials thoroughly;
      - 3) Spray materials repeatedly during the work process to maintain a continuously wet condition throughout progress of the removal work; and,
      - 4) Wetting agent shall be applied in such a manner so as to minimize drips and puddles.
    - c. Contractor shall remove the saturated ACM in small sections. Do not allow materials to dry out. As they are removed, place the materials in sealable plastic bags of six mil minimum thickness.



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- d. Bags containing ACM or asbestos-contaminated materials shall be placed by Contractor in plastic bags of six mil minimum thickness, sealed, and labeled with the appropriate wording per regulatory agencies having jurisdiction (EPA, OSHA, EPD, DOT).
  - e. Contractor shall double-bag used protective clothing, cleaning tools, plastic sheeting and other secondary waste in six-mil plastic bags and for disposal.
  - f. Contractor shall maintain general cleanup of work area concurrent with the removal of all ACM, and not permit accumulation of debris on work area floors.
  - g. After removal of ACM, Contractor shall wet clean all hard surfaces in the work area to remove residual accumulated materials, and continue wet cleaning until all hard surfaces are free of visible debris.
  - h. After removal of ACM, Contractor shall HEPA-vacuum all porous surfaces in the work area to remove residual accumulated materials until all porous surfaces are free of visible debris.
- G. Asbestos Abatement Clean Up
- 1. The Contractor shall provide general cleanup of work areas concurrent with the removal of asbestos-containing materials. Do not permit accumulation of debris within work areas.
  - 2. Containment clearance sequence for negative pressure work areas if needed, the Contractor shall:
    - a. Wet clean and HEPA-vacuum surfaces in the work areas.
    - b. Clean equipment (excluding that which will be needed for further cleaning phases) used in the work areas and remove from work areas via the equipment decontamination enclosure system.
    - c. Replace pre-filters in air filtration devices with clean filters. Clean air filtration devices.
    - d. Contractor shall maintain critical barriers.
    - e. HEPA-vacuum and wet clean surfaces in the work area.
    - f. Notify Owner's Representative for observation to determine completeness of cleaning. Work area will be observed for the presence of visible dust, dirt and debris. The Contractor shall re-clean, and continue to clean at Contractor's expense, areas with observed visible dust, dirt or debris
  - 3. The Contractor shall consider work areas complete when:
    - a. Surfaces are free from dust, dirt, residue, and debris from abatement operations or other activities subordinate to these operations.
    - b. The level of cleanliness has been approved by Owner's Representative; and,
    - c. Air testing performed by the Owner's Representative indicates that the air in the work area is acceptable, as specified.
- H. Disposal of Asbestos Contaminated Waste
- 1. Asbestos-containing waste (including but not limited to: used cleaning tools, towels, protective suits, used plastic sheeting and spray-applied plastic sheeting shall be treated as non-friable waste materials) shall be transported to the authorized landfill double bagged.
  - 2. Follow decontamination procedures as follows:
    - a. After double-bagged contaminated waste is moved out through the decon system, Contractor shall wet wipe bags to remove contamination from them before they are moved into uncontaminated space.
    - b. As each bag of waste is removed from the work area, Contractor shall note in the asbestos waste log as specified.
  - 3. Contractor shall remove sealed and labeled containers of asbestos-containing material and waste and transport them for disposal to an approved sanitary landfill as follows.
    - a. Line dumpster, trailer or other waste transport with at least two layers of six-mil plastic sheeting.





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- b. Notify Owner's Representative prior to removing each trailer or other waste transport from the Site.
- c. Notify Owner or Owner's Representative not less than 48 hours prior to the proposed time of delivery of asbestos-containing waste to the landfill. The Owner or Owner's Representative may elect to observe this operation.
- d. Asbestos containing waste material shall be treated, packaged, labeled, transported, and disposed of in accordance with 29 CFR 1926.1101 (OSHA), 40 CFR 61.150 (EPA) and 49 CFR 107 et al., (DOT).
- e. Allow only sealed plastic bags to be deposited in landfill. Place leaking or unsealed bags in a new bag and seal prior to deposition.
- f. Ensure that there are no visible emissions to the outside air from Site where materials and waste are deposited.
4. Alternative methods of transporting asbestos-containing debris will be considered by Owner's Representative but must not be used until accepted by Owner's Representative.
- I. Final Visual and Final PCM Clearance Testing
  1. Once the work is complete and the area is free of all identified asbestos, asbestos contaminated materials, waste bags, equipment, and materials the Owner's Representative will perform a final visual inspection to ensure all visible asbestos has been removed.
  2. The Owner's Representative will test for final air clearance when work area is observed by Owner's Representative to be visually decontaminated.
  3. At least one sample per work area will be collected and analyzed. Each work area will be considered clean if samples indicate airborne fiber concentrations are 0.01 fibers per cubic centimeter (flee) or less of if the airborne fiber concentrations are below the ambient prevalent level.
  4. The Contractor shall re-clean, and continue to clean at the Contractor's expense, areas which do not comply with the specified final clearance level.
  5. The Contractor shall bear the cost of follow-up testing necessitated by failure of the air tests to meet the specified final clearance level.
  6. Upon notification from the Owner's Representative that final clearance samples indicate acceptable airborne levels, the Contractor shall dismantle work area containment and thoroughly HEPA-vacuum and wet clean immediate areas.
  7. The Contractor shall dispose of debris from removal operation, used cleaning materials, unsalvageable materials used for sturdy barriers, and other remaining materials. The Contractor shall consider the materials to be contaminated, and dispose of accordingly.

**3.11 LEAD REMOVAL SUMMARY OF WORK**

- A. Work Included:
  1. The lead containing materials to be removed and disposed of are detailed in the report entitled, "Lead-Based Paint Survey, Goleta Train Depot, 27 South La Patera Lane, Goleta, California, 93117" by All Phase Environmental, Inc. dated November 30, 2023.
  2. Contractor shall verify actual quantities present and shall not rely on the quantities described in the report.
  3. Contractor shall establish work area containment(s) and remove the lead containing components utilizing the required engineering controls and personal protective equipment (PPE). The Contractor shall decontaminate the work area containments and dispose of the lead waste. The Contractor shall supply all labor, materials, equipment, services, insurance and incidentals, which are necessary or required to perform the Work. The Work shall be performed in accordance with applicable governmental regulations and these Specifications.
  4. The Contractor shall supply all labor, materials, equipment, services, insurance and incidentals, which are necessary or required to perform the Work. The Work shall be



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performed in accordance with applicable governmental regulations and these Specifications.

5. The Contractor will be responsible for all medical monitoring before and after abatement in accordance with applicable laws and regulations including without limitation OSHA 29 CFR 1910.1025, 1926.62 and Title 8, CCR 1532.1.
  6. The Contractor will be responsible for all environmental and health and safety monitoring including without limitation conducting personal breathing zone monitoring and the posting of results.
  7. The Contractor will be responsible for conducting all lead waste characterization tests to determine the proper disposal of lead waste generated by lead related paint/component removal or paint stabilization activities. Testing conducted by the Contractor, the Owner's Representative will observe all sample collection and shall be provided copies of the sample analysis prior to disposal of the Lead waste. This may include but is not limited to Total Threshold Limit Concentration (TTLC), Soluble Threshold Limit Concentration (STLC) and Toxicity Characteristic Leaching Procedure (TCLP) (when applicable) testing.
  8. The Contractor will be responsible for the removal, as specified, and proper packaging, labeling, storage, and transportation and disposal of all Lead-containing/lead based paint and lead materials removed from surfaces as well as all removed components in the affected area(s).
  9. The Contractor is responsible for performing abatement work in the Phases established by the Owner's Representative.
- B. Exposure Monitoring
1. Sample of breathing zone exposure as if no respirator were worn.
  2. Sample for at least (7) hours of the 8-hour work shift.
  3. Sample the most exposed employee for each job classification in each different work area.
  4. Full shift samples must be representative of the employees' regular daily exposure to Lead.
  5. The employer must determine by air sampling if employees are exposed to lead at or above the Action Level or above the Permissible Exposure Limit.
  6. A final report of all records shall be submitted to the Owner's Representative.
  7. Frequency: If initial monitoring results show that occupational exposure of workers is below the Action Level, then only periodic monitoring is required.
- C. Housekeeping
1. Maintain the surfaces as free of Lead as practical.
  2. Air cleaning with air hoses or blowers on surfaces is prohibited.
  3. Shoveling, or gross removal may only be done in enclosed, ventilated areas and where employees are properly protected.
  4. Where vacuuming is used, the vacuum must be fitted with a HEPA filter.
  5. Hygiene Facility: The employer shall provide clean, adequate hygiene facilities to comply with 29 CFR 1926.62 and CCR Title 8, 1532.1. Washing facilities are required. Employees need to wash their hands and face before eating, drinking, chewing, or smoking.
  6. Medical Surveillance: The employer shall make available initial medical surveillance to employees occupationally exposed on any day to lead at or above the action level. The employer shall also initiate a program of medical surveillance for all employees who are or may be exposed at or above the action level for more than 30 days in any consecutive 12 months. The medical surveillance shall be made by a licensed physician using the protocol defined in 29 CFR 1926.62 and CCR Title 8, 1532.1.
  7. The safety of the Contractor's employee used under this contract specification and any visitors on the job site are the sole responsibility of the Contractor.
  8. Maintain the surfaces as free of Lead as practical.
- D. Permits and Notifications





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1. Secure all necessary permits in conjunction with the Lead related work and provide timely notification of such actions as may be required by Federal, State or Local authorities. Except, as negotiated, the Contractor shall procure and pay for all permits and inspections, except those performed by the Owner or Owner's Representative. The Contractor will be responsible for the determination of required notifications and postings to the California Department of Public Health (Title 17, Div 1, Ch 8) and/or Cal-OSHA, for the lead work to be conducted.
- E. Work Plan, Schedule, and Submittals:
1. The Contractor shall prepare a detailed plan of the work procedures to be used, the method(s) of area isolation and fiber control, locations of decontamination units, and the storage of wastes. This plan shall also include a schedule of on-site activities indicating when lead removal will be conducted to include the start and completion dates. The schedule must state when each phase of work is anticipated to begin and end. The Contractor shall notify the Owner's Representative a minimum of 72 hours prior to changing the schedule.
  2. Work shall be conducted in one 8 hour shift Monday through Friday between 6:00 am to 6:00 pm unless specifically authorized by the Owner.
  3. Testing Laboratory: Submit the name, address and telephone number of the testing laboratory selected for any necessary monitoring of airborne concentrations of Lead as well as the lead waste characterization testing. The analytical laboratory shall be accredited by AIHA, ELLAP, or NLLAP and be a current participant in the AIHA, NIOSH, EPA Environmental Lead Proficiency Analytical Testing Program (ELPAT).
  4. The results of air monitoring or blood Lead analyses shall be submitted to the Owner's Representative for review within 24 hours after the Contractor receives them.
  5. Submit copies of any required permits as they pertain to the identified Lead related work as applies, and proof that all arrangements have been made for the transportation and disposal of the Lead bearing materials and refuse to a dumpsite approved by the EPA or local authorities.
  6. Close Out Documentation: within 10 days of project completion Contractor must provide all documentation generated during the project. Documentation shall include but is not limited to: supervisors daily logs, signed daily personnel logs, visitor entry/exit logs, employee entry/exit logs for regulated areas, manometer print reports or logs (as applicable), filter change logs for all air filtration units, water, and respirators, air monitoring sample results for personnel, work areas, air monitoring sample results for air filtration (when required), safety meeting attendance and any other contractor generated documentation.

**3.12 LEAD REMOVAL PRODUCTS**

- A. Respirators: Select respirators from those currently approved by the National Institute for Occupational Safety & Health (NIOSH) as defined in the NIOSH Certified Equipment List (most current). Provide respirators of the type listed in the Tables of 29 CFR 1910.134 and CCR Title 8, 5144 for the airborne concentrations of Lead encountered for handling, removal, decontamination, packaging or disposal. If the lead related work to be conducted does not fall into one of the OSHA "Trigger Tasks," the Contractor must initially measure the airborne concentrations and select the appropriate respirator. Historical data may be relied upon for proper respirator selection if the data conforms with the OSHA, Cal-OSHA requirements including any exceptions. Plastic sheet used for Lead abatement shall be used in sufficient size and length to reduce the number of joints. Typically accepted is 4 mil for walls and 6 mil for floors. Any plastic bags used for containment of Lead bearing material refuse, contaminated clothing or tools, or other materials used in the work area shall be polyethylene and a minimum of 6 mil in thickness. The bags must be labeled with a proper warning/generator label, sealed and placed into a secure holding vessel. Protective Clothing: The Contractor must provide



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workers who may be exposed to Lead dust, or airborne concentrations above the OSHA PEL, protective clothing and work

- B. Plastic sheet used for Lead abatement shall be used in sufficient size and length to reduce the number of joints. Typically accepted is 4 mil for walls and 6 mil for floors.
- C. Any plastic bags used for containment of Lead bearing material refuse, contaminated clothing or tools, or other materials used in the work area shall be polyethylene and a minimum of 6 mil in thickness. The bags must be labeled with a proper warning/generator label, sealed and placed into a secure holding vessel.
- D. Protective Clothing: The Contractor must provide workers who may be exposed to Lead dust, or airborne concentrations above the OSHA PEL, protective clothing and work clothing, such as coveralls, or similar full body clothing, head covers, gloves, hats, shoe covers, and face shield or goggles, where required.
- E. The Contractor shall post the following warning signs in each work area where the PEL could reasonably be exceeded:

**DANGER LEAD  
WORK AREA  
MAY DAMAGE FERTILITY OR THE UNBORN CHILD  
CAUSES DAMAGE TO THE CENTRAL NERVOUS SYSTEM  
DO NOT EAT, DRINK, OR SMOKE IN THIS AREA**

**3.13 LEAD REMOVAL WORK PROCEDURES**

- A. All Lead-related work must be performed in accordance with all applicable Federal, State, and local regulations. At a minimum, the following procedures that are known to control the release and spreading of Lead dust must be utilized:
  - 1. Wet removal procedures.
  - 2. Proper housekeeping (continual cleaning of work area) including the use of HEPA vacuums.
  - 3. Personal Protective Equipment must be worn where workers are in contact with Lead dust and use of hygiene facilities to prevent spread of contamination.
  - 4. Negative pressure enclosures to enclose Lead paint removal operations where mechanical sanding and abrasive blasting methods are used.
- B. Establish designated limits to the Lead work area by using Lead Warning tape and install hard barriers such as temporary fencing or temporary walls around the perimeter of the work area if necessary
- C. Properly demarcate with bilingual Lead Warning signs at all approaches to the regulated work areas to prevent unauthorized personnel entering the regulated work area(s).
- D. Install a Decontamination area.
- E. Continual misting (wet methods) shall be conducted prior to and during all demolition activities including segregation and loading of debris.
- F. Clean-up activities must be conducted by the Contractor on a continuous basis. If the Owner's Representative observes a large amount of accumulated lead debris the removal activities will cease, and clean-up activities will continue until approval by the Owner's Representative to resume the lead-related demolition activities.
- G. After thorough cleaning of the workspace, and satisfactory degree of cleanliness has been achieved, the Contractor shall notify the Owner's Representative that the workspace is ready for inspection. The Owner's Representative and the Contractor shall then visually inspect the workspace for the detection of any visible lead dust or lead contamination. If the visual inspection does not reveal any dust or other signs of contamination, final testing may commence.



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- H. The Contractor will then perform lead dust wipe sampling on the floor and/or horizontal surfaces in accordance with the clearance sampling requirements specified in the HUD Guidelines at a minimum under the observation of the Owner's Representative. All fees associated with taking and analyzing clearance sampling shall be borne by the Contractor.
- I. Lead-Contaminated Dust is defined by the California Department of Public Health as dust that contains an amount of lead equal to, or in excess of, ten micrograms per square foot (10 µg/ft<sup>2</sup>) for interior floor surfaces, 100 µg/ft<sup>2</sup> for interior horizontal surfaces, and 400 µg/ft<sup>2</sup> for exterior floor and exterior horizontal surfaces. The California Department of Public Health Standards for clearance shall apply.
- J. Areas exceeding the clearance level shall be re-cleaned, re-encapsulated and re-tested by the Contractor until acceptable clearance levels are obtained. All fees associated with taking and analyzing the re-testing clearance sampling shall be borne by the Contractor.
- K. Following the satisfactory completion of clearance lead dust wipe sampling testing, work area isolation barriers shall be removed by the abatement contractor and properly disposed of.

**END OF SECTION**

**SECTION 02 41 00  
DEMOLITION**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. General: Perform demolition in accordance with requirements of the Contract Documents.
- B. Related Work Specified Elsewhere
  - 1. Section 01 81 13 "Sustainable Design Requirements" for additional references, definitions, documentation requirements, action plans, meetings, and performance requirements of products and systems.
- C. Refer to Sheet A011 and Alternates Section 01 23 00 for additional demolition notes and requirements.
- D. Refer to Sheet A050 to A054 for additional requirements for indoor air quality, construction waste monitoring and additional criteria.

**1.2 DEFINITIONS**

- A. Remove: Remove and legally dispose of items except those indicated to be reinstalled, salvaged, or to remain the Owner's property.
- B. Remove and Salvage: Items indicated to be removed and salvaged remain the Owner's property. Remove, clean, and pack or crate items to protect against damage. Identify contents of containers and deliver to Owner's designated storage area.
- C. Remove and Reinstall: Remove items indicated; clean, service, and otherwise prepare them for reuse; store and protect against damage. Reinstall items in locations indicated.
- D. Existing to Remain: Protect construction indicated to remain against damage and soiling during demolition. When permitted by the Architect, items may be removed to a suitable, protected storage location during demolition and then cleaned and reinstalled in their original locations. All construction not indicated to be removed per A, B, or C shall be considered Existing to Remain.

**1.3 SUBMITTALS**

- A. Structural Calculations and Temporary Support Systems Drawings: Submit for Architect's information:
  - 1. Temporary Support Systems: Submit drawings and calculations for the temporary support systems designed by the Contractor's Professional Engineer as part of the Contractor's Quality Control Program.
- B. Detailed Demolition Schedule: Submit for Architect's and Structural Engineer's information. Before commencing work, submit for review, a detailed demolition schedule showing the commencement, the order and the completion dates for the various parts of this work. Include the following:



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1. Detailed sequence of demolition and removal work, with starting and ending dates for each activity.
  2. Detailed drawn survey indicating which services are to remain and which are to be removed and capped including locations, elevations and type.
  3. Dates for shutoff, capping, and continuation of utility services.
  4. Proposed dust-control measures.
  5. Proposed noise-control measures.
- C. Notification to Owner: Submit for Owner's documentation. Before starting work relating to existing utilities (electrical, sewer, water, heat, gas, fire lines, etc.) that will temporarily discontinue or disrupt service to the existing building, submit a notification to the Owner 72 hours in advance and obtain the Owner's approval in writing before proceeding with this phase of the work.
- D. Photographs: Submit for Owner's documentation. Submit photographs of existing adjacent structures and site improvements for record purposes. Locations of photographs shall as directed by Owner.

#### 1.4 QUALITY ASSURANCE

- A. Professional Engineering Services: The Contractor shall retain the services of a Structural or Civil Engineer licensed in the State of California to provide design of temporary bracing and shoring, which may be required as part of alteration and demolition Work.
1. It shall be the responsibility of the Contractor's Engineer to prepare detailed drawings and associated calculations representing shoring, bracing, or other temporary construction which may be required to maintain the structural stability and integrity of the existing construction during the course of the Work represented in these documents, and provide supervision during execution of the work.
  2. Drawings and calculations prepared by the Contractor's Engineer shall bear an original signature and seal indicating the Engineer's Registration. Duplicate copies of drawings and calculations shall be forwarded to the Contractor prior to commencing temporary Work represented in those documents. The Contractor shall, in turn, transmit those documents to the Architect for review.
  3. The Contractor's Engineer shall provide full-time supervision and inspection of the demolition work and report as required to the Building Official.
- B. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities, and in accordance with the requirements of Public Utility Corporations having jurisdiction over the work. Obtain approvals and pay for necessary permits, licenses and certificates and give notices as required during the performance of the demolition work.
1. Clean Air Act: Prior to commencement of site demolition work, and in accordance



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with the Federal Clean Air Act, the Contractor shall engage a Certified Asbestos Consultant to conduct an inspection and survey to determine the presence of asbestos on the project. As required by Federal Regulations, provide notification to the Federal Environmental Protection Agency, utilizing EPA approved forms, not less than 10 days prior to the commencement of site demolition work. Provide a copy of notification sent to the EPA both to the Owner and Architect. The compliance with this procedure does not supersede local requirements concerning asbestos regulations and certifications.

2. Fire Protection: Provide adequate fire protection in accordance with local Fire Department requirements. Do not close or obstruct walkways, passageways or stairways. Do not store or place materials in passageways, stairs or other means of egress. Conduct operations with minimum traffic interference.

### 1.5 PROJECT/SITE CONDITIONS

- A. Condition of Existing Structures: Owner assumes no responsibility for actual condition of existing structures to be demolished or to remain. Conditions existing at time of inspection for bidding purpose will be maintained by Owner insofar as practicable. However, variations within structure may occur by Owner's removal and salvage operations prior to start of demolition work. Contractor shall maintain records as necessary of condition of existing structures and improvements to remain that could be impacted by demolition work within and adjacent to Project limits.
- B. Salvaged Materials: Items of salvable value to Contractor may be removed from structure as work progresses. Transport salvaged items from site as they are removed. Storage or sale of removed items will not be permitted on site.
- C. Explosives: Do not bring explosives to site or use explosives without written consent of authorities having jurisdiction. Written consent will not relieve Contractor of total responsibility for injury to persons or for damage to property due to blasting operations. Perform required blasting in compliance with governing regulations.
- D. Maintenance
  1. Traffic: Conduct demolition operations and removal of debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities. Do not close or obstruct streets, walks, or other occupied or used facilities without permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
  2. Fencing: The Contractor shall erect fences as required and as agreed upon with the Owner. Fences shall be adequately braced and shall be complete with access gates and doors shown and necessary hardware as approved by the Owner. Outside face of fencing shall be given two (2) coats of paint in color selected by the Owner. Do not remove fence until completion of Work.
  3. Watchman Service: The Contractor shall employ a sufficient number of watchmen to guard the Work during non-working hours, until the Owner accepts responsibility for the premises.
- E. Noise and Vibration Control: Noise and vibration from demolition operations, including



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voice communications, shall not exceed levels permitted by local authorities and levels agreed with neighborhood representatives and Owner.

1. Sound Control Devices: Motorized equipment on the site, including hauling trucks, shall be equipped with sound control devices. The sound level measured at a distance of 15 ft. (4.5m) from equipment shall not exceed 60 decibels.
2. Chutes: Materials shall be lowered in fully enclosed chutes, acoustically lined to maintain the sound level within the limits prescribed above.
3. Voice Communication: Worker's voice communication shall be kept under control.

**F. Dust Control**

1. Prevention of Dust and Dirt: Take necessary precautions to prevent dust and dirt from rising by wetting demolished masonry, concrete, plaster and similar debris or by erected temporary enclosures, and other suitable methods to limit dust and dirt rising and scattering in air. Comply with governing regulations pertaining to environmental protection.
2. Do not use water when it may create hazardous or objectionable conditions including ice, flooding, and pollution.
3. Locate dustproof protection as directed by the Owner and as necessary to separate construction areas from existing operation areas and facilities. Coordinate construction schedule and construction work with the Owner. Maintain clearances for existing means of exiting.

**G. Cleaning of Structures and Improvements: Clean adjacent structures and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing prior to start of work. Protect construction to remain and affected by the operations under this Section by dustproof partitions or other adequate means.**

**H. Pest Control**

1. Licensed Exterminating Company: Furnish the services of a licensed exterminating company from the time the Work is started until the completion and acceptance of work for the purpose of completely exterminating rats, mice, roaches water-beetles and other pests from the existing structures and surrounding ground areas. The exterminating company shall provide labor, materials and equipment necessary for complete exterminating service within the boundary lines of the site, which shall include shanties, temporary toilets, and field offices.
2. Exterminating Company Evidence of Experience: The exterminating company shall submit satisfactory evidence of at least ten (10) years experience in this class of work, including the names and addresses of at least five (5) business concerns for whom similar services have been performed by the company within the past five (5) years.
3. Exterminating Materials and Equipment: Materials and equipment used for exterminating purposes shall comply with the rules and regulations of the





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Department of Health, and the laws, ordinances and regulations of State and Federal Agencies pertaining to chemicals or materials. The exterminating company shall post, in prominent locations, adequate warning signs for the protection of the public in accordance with requirements of agencies having jurisdiction.

4. Inspections and Treatments of Exterminating Company: Inspections and treatments by service operators of the exterminating company shall be made on a set day once each week during the regular work day hours (Monday through Friday).
5. Emergency Service: Emergency service during the regular work day hours (Monday through Friday) shall be rendered within 24 hours, if requested by the Owner.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Structural Repair Mortar: "Emaco S488 CI" (Master Builders) or equal.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verification of Conditions: Examine the areas to receive the Work and the conditions under which the Work would be performed. Remedy conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected
- B. Verify existing conditions in the field prior to the start of Work to determine extent of demolition required. If unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure both nature and extent of the conflict. Carefully examine existing as-built and existing building documents and surveys so as to become familiar with the existing structure as originally designed or later modified.

### 3.2 PREPARATION

- A. Shoring and Bracing: Provide shoring, bracing, or support to prevent movement, settlement, or collapse of areas to be removed and adjacent facilities to remain. If safety of structure appears to be endangered, cease operations and notify Architect immediately. Take precautions to support endangered work until determination is made for continuing operations.
- B. Inventory and Record of Items: Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- C. Coordination: Coordinate Work with work of other trades and verify locations to coordinate with work of other trades and field measurements.





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- D. Notification to Public Utility Corporations and Municipal Departments: Existing service piping, including sewer, water and gas lines shall be cut and capped and electric, telephone and other wires shall be cut in compliance with the requirements of the local Public Utility Corporations and of Municipal Departments having jurisdiction. Before cutting in on the above services notify the proper officials, persons or corporations owning same, obtain instructions for carrying out the Work and take precautionary measures they may deem necessary. Evidence of the discontinuation of these services shall be furnished in the form of proper releases from the appropriate agencies. Individual water taps and electrical lines used for demolition purposes shall be shut off as soon as demolition work is completed and similar evidence of the discontinuation of temporary services shall be furnished to the Owner.

### 3.3 PROTECTION

- A. Precautions: Take precautions to guard against movement, settlement or collapse of surrounding construction designated to remain and be liable for movement, settlement or collapse.
- B. Items for Proper Protection of Workers: Provide, erect and maintain catch platforms, lights, barriers, weather protection, warning signs, and other items as required for the proper protection of the workmen engaged in demolition operations, public, adjacent construction and occupants of the building.
- C. Fire Protection: Provide adequate fire protection in accordance with local Fire Department requirements.
- D. Permit for Streets or Sidewalks: Do not close or obstruct streets or sidewalks without the proper permit. Conduct operations with minimum traffic interference.
- E. Protection of Property: Protect public and private property adjacent to and on the job site and including buildings, platforms, vents, utility lines, streets, sidewalks, light standards, hydrants, street signs, mail boxes and fire alarm boxes. Make repairs necessitated by reason of, or in the course of, operations under this Contract to the complete satisfaction of the Owner of the damaged property.
- F. Explorations and Probes Prior to Demolition and Removal Work: Make explorations and probes as are necessary to ascertain required protective measures before proceeding with demolition and removal work. Give particular attention to shoring and bracing requirements so as to prevent damage to construction to remain.
- G. Temporary Protection of Existing Structure: Provide and maintain temporary protection of the existing structure designated to remain where demolition and removal work is being done, connections made, materials handled, or equipment moved.
- H. Responsibility for Construction or Building Contents: Be responsible for construction or building contents to remain to prevent damage resulting from insufficient protection.
- I. Prevention of Impact Noise or Vibration: Provide suitable measures necessary to prevent transmission of impact noise or vibration into occupied areas of Owner's existing facilities or neighboring buildings.
- J. Do not overload existing building structure. Maintain and protect the structural integrity of the existing building structure, neighboring buildings and parts.

**3.4 DEMOLITION OPERATIONS**

- A. Demolition and Removal Work: Demolition and removal work shall be as shown on the Drawings. Do work required in connection with this Project with due care, including shoring, bracing, Be responsible for damage which may be caused by work to part or parts of existing structures to remain.
- B. Materials of Items of Owner: Materials or items designated to remain the property of the Owner shall be removed with care and stored in a location on the site to be designated by the Owner.
- C. Materials of Items Not Designated to Owner: Materials or items demolished and not designated to become the property of the Owner shall become the property of the Contractor and shall be removed from the Owner's property.
- D. Execution of Demolition Work: Execute the work in a careful and orderly manner, with the least possible disturbance to the public. Proceed with demolition in systematic manner from top of structure to ground. Complete site demolition work above each floor or tier before disturbing supporting members on lower levels.
- E. Temporary Shores, Struts, Bracing Supplemental or Alternate Support: Where necessary to prevent damage or collapse of construction, install temporary shores, struts, bracing supplemental or alternate support for items not demolished or removed. Do not commence demolition work until temporary construction is complete.
- F. Below-Grade Construction: Demolish foundation walls and other below-grade construction, including concrete slabs, to a depth of not less than 12 in. (300 mm) below lowest foundation level.
- G. Paved Areas: Paved areas including walks, parking areas and roads designated for demolition shall be broken up and removed to the top of the subgrade.
- H. Handling and Disposal of Materials: Individual materials shall be handled and disposed of in the following manner unless otherwise required by Federal, State or local authorities having jurisdiction:
  - 1. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.
  - 2. Masonry: In general, demolish masonry and concrete in small sections. Remove metal reinforcement, anchors, and ties from masonry and sort with other metals. Clean and stack undamaged, whole masonry units on wood pallets.
  - 3. Wood Materials: Sort and stack members according to size, type, and length. Separate dimensional and engineered lumber, panel products, and treated wood materials.
  - 4. Metals: Separate metals by type.
    - a. Structural Steel: Stack members according to size, type of member, and length. Remove steel framing members individually and lower to ground by hoists, derricks, or other suitable methods.



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- b. Remove and dispose of bolts, nuts, washers, and other rough hardware
- 5. Roofing: Separate organic and glass-fiber shingles and felts. Remove nails, staples, and accessories.
- 6. Doors and Hardware: Brace open end of door frames. Except for removing door closers, leave door hardware attached to doors.
- 7. Carpet: Carpet shall be recycled through the new carpet manufacturer's recycling program (fiber into fiber and backing into backing).
- 8. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs.
- 9. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinkler heads, and other components by type and size.
- 10. Lighting Fixtures: Separate lamps by type and protect from breakage.
- 11. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.
- 12. Conduit: Reduce conduit to straight lengths and store by type and size.
- I. Existing service piping, including sewer, water and gas lines shall be cut and capped and electric, telephone and other wires shall be cut in compliance with the requirements of the local Public Utility Corporations and of Municipal Departments having jurisdiction. Before cutting in on the above services notify the proper officials, persons or corporations owning same, obtain instructions for carrying out the Work and take precautionary measures they may deem necessary. Evidence of the discontinuation of these services shall be furnished in the form of proper releases from the appropriate agencies. Individual water taps and electrical lines used for demolition purposes shall be shut off as soon as demolition work is completed and similar evidence of the discontinuation of temporary services shall be furnished to the Owner.
- J. Pumping Equipment, Suction and Discharge Lines: During the erection of the Work, provide, operate and maintain pumping equipment, suction and discharge lines in a number and capacity as required to keep the basement and pits free of water. Existing floor drains, as indicated, shall remain and be kept free of debris. The basement floor slabs shall be broken up to prevent the collection of water.
- K. Filling Of Areas Below Grade: Filling of areas below grade with masonry, concrete, plaster and other inorganic material will be permitted.

### 3.5 CUTTING EXISTING CONCRETE

- A. When existing concrete is cut and no new concrete will be placed against cut surface, cuts shall not damage concrete to remain and shall leave a neat, clean surface.
- B. Concrete removal methods will be determined by Contractor as long as they comply with the requirements of these documents.

- C. At edges of openings where new concrete will be placed against cut surface:
  - 1. Score surface of existing concrete so as not to produce feathered edges.
  - 2. Use care not to cut existing reinforcing that will be incorporated into the new concrete pour. Identify the depth of existing reinforcing along the length of cut with non-destructive testing devices. Verify depth of reinforcing by exposing existing reinforcing at not further than 48 inches apart.
  - 3. Depth of cut shall be no greater than one-half of concrete cover.
- D. When cutting existing concrete use care not to over-cut at end of opening.
- E. When existing reinforcing bars are to be incorporated in new concrete use care not to cut, nick, bend or damage them. Any necessary repairs to reinforcing shall be at no cost to Owner.
- F. Where it is intended that existing reinforcing be incorporated in new concrete, existing reinforcing can be either maintained for full specified length or it can be cut short and extended to specified length using specified mechanical couplers.
- G. If reinforcing bars that are partially exposed are disturbed then the bar shall be fully exposed with at least 3/4 inch minimum clearance provided all around the bar.

### **3.6 CUTTING HOLES FOR PIPE AND CONDUIT**

- A. When holes are located so that the clear distance between holes is greater than 12 inches and no reinforcing is cut then no reinforcing of the holes will be needed. If this criterion cannot be satisfied by relocating the holes please notify the Architect.
- B. Prior to cutting or coring holes, scan to locate the reinforcing on both faces of the concrete member.
- C. If reinforcing is found, relocate the hole as necessary so as not to cut reinforcing.
- D. When coring or drilling, use equipment that will turn off on encountering concrete reinforcing.

### **3.7 DAMAGED REINFORCING STEEL OR CONCRETE**

- A. When existing reinforcing bars are inadvertently cut or damaged notify Architect, who will define necessary repair procedures.
- B. When damage occurs to existing concrete that is to remain notify Architect, who will define necessary repair procedures.

### **3.8 PREPARATION OF FINISHED SURFACE**

- A. Where new concrete will be placed against existing concrete or cut concrete surfaces:
  - 1. Sandblast or water-blast all surfaces to clean and roughen the entire surface of the joint, exposing coarse aggregate solidly embedded in mortar matrix.



## SECTION 02 41 00 DEMOLITION

### DIVISION 02

2. Do not leave loosened particles of aggregate or damaged concrete at surface.
  3. Remove any bruised concrete surfaces.
- B. Where no concrete will be placed against cut surface of concrete:
1. Surface shall be smooth.
  2. Surface left by a good-quality concrete saw cut will be acceptable.
  3. Where as-cut surface is not smooth, patch surface with structural repair mortar.

### 3.9 APPLICATION OF STRUCTURAL REPAIR MORTAR

- A. Install structural repair mortar in accordance with manufacturer's instructions.
- B. Manufacturer's representative to visit site to monitor first application of structural repair mortar.

### 3.10 FIELD QUALITY CONTROL

- A. Contractor's Quality Control Responsibilities: Contractor is solely responsible for quality control of the Work.
- B. Field inspection of the noise and dust control measures are to be performed by an independent testing agency employed by the Contractor.
  1. Furnish reports for the noise and dust control measures for review by the Owner.

### 3.11 ADJUSTING

- A. Repair: Promptly repair damage to adjacent construction caused by building demolition operations.
- B. Restoration: Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials. Restore exposed finishes of patched areas and extend restoration into adjoining construction in a manner that eliminates evidence of patching and refinishing.

### 3.12 CLEANING

- A. Salvaged Materials: Remove carefully to avoid damages. Materials for reuse on this project (if any) are to be incorporated into new work as shown. Except for items indicated to be retained as Owner's property, other removed and salvaged materials not indicated for reuse shall become Contractor's property and be removed from site.
- B. Disposal of Demolished Materials: Remove [daily] [weekly] from site accumulated debris, rubbish, and other materials resulting from demolition operations in a manner to prevent spilling of debris. Do not allow removed materials to accumulate in the existing building or Owner's facilities. Burning of combustible materials from demolished structures will not be permitted on site.



**SECTION 02 41 00  
DEMOLITION**

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- C. Removal: Transport materials removed from demolished structures and legally dispose off site and in accordance with Project's Waste Management Plan.
- D. Removal after Completion of Work: Upon completion of work under this Section, remove tools, materials, plant, apparatus and rubbish. The premises shall be left clean.

**END OF SECTION**

**SECTION 03 30 00  
CAST-IN-PLACE CONCRETE**

**PART 1 - GENERAL**

**1.1 SUMMARY**

A. Section Includes:

1. Cast-in-place concrete, including furnishing, concrete materials, mix design, placement procedures, curing, and finishes, except as otherwise specified.
2. Grout, except as otherwise specified.
3. Placing of embedded anchor bolts and inserts.
4. Vapor Retarders
5. Miscellaneous concrete work.

**1.2 RELATED SECTIONS:**

- A. Section 03 33 00 Architectural Concrete.

**1.3 DEFINITIONS**

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.

**1.4 SUBMITTALS**

- A. Comply with pertinent provisions of Section 01 33 00 - Submittal Procedures.
- B. Product Data: For each type of manufactured material and product including but not limited to concrete admixtures, non-shrink grout, etc.
- C. Name and address of the proposed concrete supplier.
- D. Design Mixes: For each concrete mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances that may warrant adjustments.

**1.5 QUALITY ASSURANCE**

- A. Installer Qualifications: An experienced installer who has completed concrete work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.



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- B. **Manufacturer Qualifications:** A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C94 requirements for production facilities and equipment. Manufacturer must be certified according to the National Ready Mixed Concrete Association's Certification of Ready Mixed Concrete Production Facilities.
- C. **Concrete Testing and Inspection Services:** The Owner's Representative will engage a qualified independent testing agency to perform evaluation tests and special inspections per Structural Notes on Drawings and as required by the Code. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
- D. **ACI Publications:** Comply with the following, unless more stringent provisions are indicated:
  - 1. ACI 301, "Specification for Structural Concrete."
  - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

**1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver, store, and handle all material to prevent damage.
- B. Ready-mixed concrete shall be placed in its final position within 1 ½ hours after water is first added to the mixture.
- C. Mix concrete only in such quantities as are required for immediate use, and use while fresh before initial set has taken place. Concrete which has developed initial set shall not be used. Concrete which has partially hardened shall not be retempered or remixed.
- D. Use all means necessary to protect cast-in-place concrete materials before, during, and after installation and to protect the installed work and material of all other trades.
- E. In the event of damage, immediately make all repairs and replacement necessary to the approval of the Engineer and at no cost to the Owner's Representative.

**PART 2 - PRODUCTS**

**2.1 CONCRETE MATERIALS**

- A. **Portland Cement:** ASTM C150, Type V – Moderate to High Sulphate Resistance from one approved source.
- B. **Normal-Weight Aggregate:** ASTM C33, uniformly graded, and as follows:
  - 1. Nominal maximum Aggregate Size: 1 inch, except maximum 1-1/2 inch size for foundations.
  - 2. Not exceeding 3/4 of minimum clear space between bars and forms, nor larger than 1/5 of the least dimensions between the forms.





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3. 3/8 inch maximum aggregate size may be used in congested areas and in thin sections when approved by the Engineer.
- C. Lightweight Aggregate: ASTM C330/C 330M, 3/4 inch nominal maximum aggregate size.
- D. Water: Potable and complying with ASTM C94.
- E. Admixtures: Admixtures certified by manufacturer to contain no more than 0.1 percent water-soluble chloride ions by mass of cementitious material and to be compatible with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride. All admixtures are subject to Engineer's approval.
  1. Air-Entraining Admixture: ASTM C260.
  2. Water-Reducing Admixture: ASTM C494, types A & D or F & G.
  3. Retarding Admixture: ASTM C494/C494M, Type B.
  4. Chemical admixtures shall be added to the concrete during the mixing process by automatic mechanical dispensing units. These dispensers shall be calibrated periodically to insure accuracy. On site plasticizing admixtures shall be added in accordance with manufacturer's instructions and/or recommendations.
- F. Curing Material: Provide concrete curing, and curing and sealing compounds complying with South Coast AQMD for limitation of VOC content.
  1. Where access flooring is indicated, coordinate selection of curing and sealing compounds with access floor manufacturer to verify product is compatible with pedestal adhesive.
  2. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C309, Type 1, Class B.
  3. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C1315, Type 1, Class A.
- G. Non-Shrink Grout: Conform to Corps of Engineers CRD-C 621, and as follows:
  1. Non-metallic: Master Builders " Masterflow 928", or Euclid "Euco Hi-Flow Grout", or equal, non-gas-forming and free of oxidizing catalysts and inorganic accelerators, used as dry or damp pack, or mixed to a 20-second flow (CRC-C 621), without segregation or bleeding at any temperature between 45 degrees F and 100 degrees F. Working time 30 minutes or more.
  2. Epoxy grout where indicated: Multi-component, premeasured, fast-curing combination of thermosetting resins and inert fillers, Master Builders "Ceilcote 648", Sikadur 42 Industrial Group-Pak by Sika Chemical Corporation, or Euclid "Euco High Strength Grout", or approved equal.



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- H. Drypack: Field mixture of 1 part Portland cement to 2 parts fine aggregate mixed to a damp consistency such that a ball molded in the hands will stick together and hold its shape. At Contractor's option, the specified admixture may be added for increased workability at lower water/cement ratio. In lieu of field mixing, Contractor may use factory mixed drypack material, such as Master Builders "SetGrout" or Euclid "Euco Dry Pack Grout", or equal.
- I. Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber, or ASTM D1752, cork or self-expanding cork.
- J. Construction Joint Materials: "Key-Kold" or "Kwik-Joint", or equal, of profiles indicated.
- K. Bonding Agent: ASTM C1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- L. Epoxy-Bonding Adhesive: ASTM C881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements, and as follows:
  - 1. Type: Class II, non-load bearing, for bonding freshly mixed concrete to hardened concrete.
- M. Rigid Foam: "Insulfoam" Type 1 expanded polystyrene (EPS) foam plastic boards by Premier Industries, Inc./dba Insulfoam, 1019 Pacific Ave., Ste. 1501, Tacoma, WA 98402, or approved equal.
- N. Truncated Domes: Refer to 03 33 00 Architectural Concrete

**2.2 CONCRETE MIXES**

- A. Concrete mixes shall be in accordance with this section unless noted otherwise on the Drawings.
- B. Mix shall be signed and sealed by a California-licensed professional engineer. Prepare design mixes for each type and strength of concrete determined by either laboratory trial mix or field test data bases, as follows:
  - 1. Proportion normal-weight concrete according to CBC Chapter 19, ACI 211.1, and ACI 301.
  - 2. Proportion lightweight structural concrete according to CBC Chapter 19, ACI 211.2, and ACI 301.
- C. Strength of Concrete: Strengths and types of concretes shall be as indicated in the Drawings.
- D. Maximum Water-Cementitious Materials Ratio: 0.45 for all concrete unless specified or noted otherwise on the drawings.



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- E. Air Content: Add air-entraining admixture at manufacturer's prescribed rate to result in concrete having an air content of 5 percent, plus or minus 1.5 percent at point of delivery.
- F. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- G. Admixtures: Use admixtures according to manufacturer's written instructions.
  - 1. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) 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.

### 2.3 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C94, and furnish batch ticket information.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C94. Mix concrete materials in appropriate drum-type batch machine mixer.
  - 1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least one and one-half 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, mix type, mix time, quantity, and amount of water added. Record approximate location of final deposit in structure.

### 2.4 BONDING AND JOINTING PRODUCTS

- A. Latex Bonding Agent:
  - 1. Interior Only (PVA):
    - a. Basis of Design: L&M Construction Chemicals EVERWELD [www.lmcc.com](http://www.lmcc.com),
    - b. US Spec "Bondcoat" [www.usspec.com](http://www.usspec.com)
    - c. Larsens' Weld Crete [www.larsenproducts.com](http://www.larsenproducts.com).
  - 2. Interior Only for Bonding Existing Concrete to Fresh Concrete (Epoxy):
    - a. Sika Sikadur 32, Hi-Mod [www.sikausa.com](http://www.sikausa.com).



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- b. US spec Maxi-Bond 2500 [www.usspec.com](http://www.usspec.com).
    - c. W.R. Meadows Rezi-Weld [www.wrmeadows.com](http://www.wrmeadows.com).
  - 3. Exterior and Interior (acrylic latex):
    - a. Euclid Eucobond [www.euclidchemical.com](http://www.euclidchemical.com).
    - b. W.R. Meadows Intralok [www.wrmeadows.com](http://www.wrmeadows.com).
    - c. US Spec Acylcoat [www.usspec.com](http://www.usspec.com).
    - d. Dayton Bond J40 [www.daytonsuperiorchemical.com](http://www.daytonsuperiorchemical.com).
- B. Waterstops: PVC, complying with COE CRD-C 572.
- C. Configuration: As indicated on the drawings.
- D. Size: As indicated on the drawings.
- E. Reglets: Formed steel sheet, galvanized, with temporary filler to prevent concrete intrusion during placement.
  - 1. Size: As indicated on drawings.
  - 2. Size: 1/2 inch throat, 1/2 inch deep.
- F. Slab Isolation Joint Filler: 1/2 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.
  - 1. Material: ASTM D1751, cellulose fiber.
- G. Slab Contraction Joint Device: Preformed linear strip intended for pressing into wet concrete to provide straight route for shrinkage cracking.
- H. Slab Construction Joint Devices: Combination keyed joint form and screed, galvanized steel, with rectangular or round knockout holes for conduit or rebar to pass through joint form at 6 inches on center; ribbed steel stakes for setting.
  - 1. Provide removable plastic cap strip that forms wedge-shaped joint for sealant installation.
  - 2. Height: To suit slab thickness.

**2.5 VAPOR RETARDERS**

- A. Underslab Vapor Retarder: Multi-layer, fabric-, cord-, grid-, or aluminum-reinforced polyethylene or equivalent, complying with ASTM E1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. The use



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of single-ply polyethylene is prohibited. Tape all seams per manufacturer's recommendations. All terminations shall be taped and sealed.

1. Installation: Comply with ASTM E1643.
2. Permeance of less than 0.01 Perms [grains/(ft<sup>2</sup> / hr / inHg)] as tested in accordance with ASTM E1745 Section 7.1 (7.1.1-7.1.5).
3. Accessory Products: Vapor retarder manufacturer's recommended seam tape, adhesive, perimeter/edge seal, mastic, prefabricated boots, etc., for sealing seams and penetrations in vapor retarder.
4. Manufacturers:
  - a. Basis of Design: Stego Industries, LLC; Stego Wrap, 15 mils: [www.stegoindustries.com](http://www.stegoindustries.com).
  - b. Poly-America; Husky Yellow Guard 15-mil Vapor Barrier: [www.yellowguard.com/#sle](http://www.yellowguard.com/#sle).
  - c. Insulation Solutions, Inc; Viper VaporCheck II 15-mil (Class A): [www.insulationsolutions.com](http://www.insulationsolutions.com).

- B. Substitutions: Refer to Division 01.

**PART 3 - EXECUTION**

**3.1 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. Use Setting Drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
1. Install anchor bolts, accurately located, to elevations required.
  2. Install reglets to receive top edge of foundation sheet 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. Install dovetail anchor slots in concrete structures as indicated.

**3.2 VAPOR RETARDERS**

- A. Interior Slabs on Grade: Install vapor retarder under all interior slabs on grade. Lap joints minimum 6 inches. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions.



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1. Vapor Retarder Over Granular Fill: Install compactible granular fill before placing vapor retarder as shown on the drawings. Do not use sand.
2. Unroll vapor barrier with the longest dimension parallel with the direction of the concrete placement and face laps away from the expected direction of the placement whenever possible.
3. Extend vapor barrier to the perimeter of the slab. If practicable, terminate it at the top of the slab, otherwise (a) at a point acceptable to the structural engineer or (b) where obstructed by impediments, such as dowels, waterstops, or any other site condition requiring early termination of the vapor barrier. At the point of termination, seal vapor barrier to the foundation wall, grade beam or slab itself.
4. Extend vapor barrier over footings and grade beams to a distance acceptable to the structural engineer or stop at impediments such as dowels and waterstops.
5. Seal vapor barrier to foundation wall, grade beam, or slab at an elevation consistent with the top of the slab or terminate at impediments such as waterstops or dowels.
6. Overlap joints 6 inches and seal with manufacturer's seam tape.
7. No penetration of the vapor barrier is allowed except for reinforcing steel and permanent utilities.
8. Repair damaged areas by cutting patches of vapor barrier, overlapping damaged area 6 inches and taping all sides with tape.

### **3.3 CONCRETE PLACEMENT**

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement, unless approved by Engineer.
- C. Before placing concrete, water may be added at Project site, subject to limitations of ACI 301.
- D. Do not add water to concrete after adding high-range water-reducing admixtures to mix.
- E. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation.
- F. Deposit concrete in forms in horizontal layers no deeper than 24 inches and in a manner to avoid inclined construction joints. Place each layer while preceding layer is still plastic, to avoid cold joints.



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1. Consolidate placed concrete with mechanical vibrating equipment. Use equipment and procedures for consolidating concrete recommended by ACI 309R.
  2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the vibrator. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix constituents to segregate.
- G. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by low temperatures.
1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
  2. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.
- H. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows, when hot-weather conditions exist:
1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
  2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
  3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

**3.4 MISCELLANEOUS CONCRETE ITEMS**

- A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete 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: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at



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correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.

#### 3.5 GROUTING

- A. Install as indicated or required. Where grouting and drypacking is part of the work of other sections, it shall conform to the following requirements, unless specified otherwise.
- B. Non-Shrink Grouting:
  - 1. Mixing: Mix the approved non-shrink grout material with sufficient water per manufacturer's recommendations.
  - 2. Application: Surfaces to receive the non-shrink grout shall be clean, and shall be moistened thoroughly immediately before placing the mortar. Before grouting, surfaces to be in contact shall be roughened and cleaned thoroughly, all loose particles shall be removed and the surface flushed thoroughly with neat cement grout immediately before the grouting mortar is placed. Place fluid grout from one side only and puddle, chain, or pump for complete filling of voids; do not remove the dams or forms until grout attains initial set. Finish exposed surfaces smooth, and cure as recommended by grout manufacturer.

#### 3.6 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with recommendations in ACI 305R for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft./hr before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing by one or a combination of methods noted in paragraph 3.9D.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces, by one or a combination of the following methods:
  - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
    - a. Water.
    - b. Continuous water-fog spray.





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- c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
  - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
  - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
  - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer recommends for use with floor coverings.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

### 3.7 SLAB JOINTING

- A. Locate joints as indicated on the drawings. Unless noted otherwise or directed by Engineer, locate joints at quarter-span of structural beam and slab pours.
- B. Reinforcing shall be continuous through construction joints. Provide shear keys as detailed
- C. Anchor joint fillers and devices to prevent movement during concrete placement.
- D. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.
  1. Install wherever necessary to separate slab from other building members, including columns, walls, equipment foundations, footings, stairs, manholes, sumps, and drains.
- E. Load Transfer Construction and Contraction Joints: Install load transfer devices as indicated; saw cut joint at surface as indicated for contraction joints.



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- F. Saw Cut Contraction Joints: Saw cut joints before concrete begins to cool, within 4 to 12 hours after placing; use 3/16 inch thick blade and cut at least 1 inch deep but not less than one quarter (1/4) the depth of the slab.
- G. Construction Joints: Where not otherwise indicated, use metal combination screed and key form, with removable top section for joint sealant.

### **3.8 FLOOR FLATNESS AND LEVELNESS TOLERANCES**

- A. An independent testing agency, as specified in Section 01 4000, will inspect finished slabs for conformance to specified tolerances.
- B. Maximum Variation of Surface Flatness:
  - 1. Exposed Concrete Floors: 1/4 inch in 10 feet.
  - 2. Under Seamless Resilient Flooring: 1/4 inch in 10 feet.
  - 3. Under Carpeting: 1/4 inch in 10 feet.
  - 4. Under Stone: 1/8" in 10 ft.
- C. Correct the slab surface if tolerances are less than specified.
- D. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

### **3.9 CONCRETE FINISHING**

- A. Repair surface defects, including tie holes, immediately after removing formwork.
- B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/8 inch or more in height.
- C. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/8 inch or more in height. Provide finish as follows:
  - 1. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.
  - 2. Grout Cleaned Finish: Wet areas to be cleaned and apply grout mixture by brush or spray; scrub immediately to remove excess grout. After drying, rub vigorously with clean burlap, and keep moist for 36 hours.
- D. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:



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- E. Surfaces to Receive Thick Floor Coverings: "Wood float" as described in ACI 302.1R; thick floor coverings include quarry tile, ceramic tile, and Portland cement terrazzo with full bed setting system.
1. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI 302.1R; thin floor coverings include carpeting, resilient flooring, seamless flooring, resinous matrix terrazzo, thin set quarry tile, and thin set ceramic tile.
    - a. Decorative Exposed Surfaces: Trowel as described in ACI 302.1R; use steel-reinforced plastic trowel blades instead of steel blades to avoid black-burnish marks; decorative exposed surfaces include surfaces to be stained or dyed, pigmented concrete, surfaces to receive liquid hardeners, surfaces to receive dry-shake hardeners, surfaces to be polished, and all other exposed slab surfaces.
    - b. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains as indicated on drawings.

### 3.10 FIELD QUALITY CONTROL

- A. Testing Agency: Owner's Representative will engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement. Sampling and testing for quality control may include those specified in this Article.
- B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C172 shall be performed according to the following requirements:
1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mix placed each day.
  2. Slump: ASTM C143; one test at point of placement for each composite sample, but not less than one test for each day's pours of each concrete mix. Perform additional tests when concrete consistency appears to change.
  3. Air Content: ASTM C231, pressure method, for normal-weight concrete; ASTM C173, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pours of each concrete mix.
  4. Concrete Temperature: ASTM C1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
  5. Unit Weight: ASTM C567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pours of each concrete mix.
  6. Compression Test Specimens: ASTM C31/C31M; cast and laboratory cure one set of four standard cylinder specimens for each composite sample.



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- a. Cast and field cure one set of four standard cylinder specimens for each composite sample.
- 7. Compressive-Strength Tests: ASTM C39; test one laboratory-cured specimens at 7 days, two at 28 days, and hold one for future testing should it be required.
  - a. Test one field-cured specimen at 7 days, two at 28 days, and hold one for future testing should it be required.
  - b. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at age indicated.
- C. 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.
- D. Strength of each concrete mix 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.
- E. Test results shall be reported in writing to Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-and 28-day tests.
- F. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Engineer but will not be used as sole basis for approval or rejection of concrete.
- G. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Engineer. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42 or by other methods as directed by Engineer.

**3.11 DEFECTIVE CONCRETE**

- A. Test Results: The testing agency shall report test results in writing to Architect, Owner and Contractor within 24 hours of test.
- B. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.
- C. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.



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- D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

**3.12 PROTECTION**

- A. Do not permit traffic over unprotected concrete floor surface until fully cured.
- B. Protect finished surfaces from stains or abrasions. Protect surfaces or edges by leaving forms in place or by providing temporary covers. Protect concrete from rain, flowing water or mechanical injury.
- C. Protect floor slabs from the droppings of plaster, paint, dirt, and other marring by covering with polyethylene plastic sheet, or other acceptable floor protection covering, well lapped and sealed.
  - 1. Where concrete slabs are scheduled to be the finished floor surface, or where slab is treated with a special concrete finish serving as the finished floor surface, provide a continuous covering of 1/2 inch particle board, joints tightly butted and cut to sizes tight to wall construction, over entire floor area over polyethylene plastic sheet, or other acceptable floor protection sheeting. Maintain covering (polyethylene and particleboard) in good condition until danger of damage is past.

**END OF SECTION**

**SECTION 03 33 00  
ARCHITECTURAL CONCRETE**

**PART 1 – GENERAL**

**1.1 SUMMARY**

- A. General: Provide architectural concrete in accordance with requirements of the Contract Documents.
- B. Related Work Specified Elsewhere.
  - 1. Section 01 81 13 “Sustainable Design Requirements” for additional references, definitions, documentation requirements, action plans, meetings, and performance requirements of products and systems.
  - 2. The provisions of this Section are in addition to the requirements of Section 03 30 00 “Cast in Place Concrete” Furnishing of Inserts and items to be embedded in concrete as part of the Work of this Section.
  - 3. 05 50 00 “Metal Fabrications” for Skateboard Deterrents.

**1.2 REFERENCES**

- A. General: Comply with the applicable provisions of the referenced standards except as modified by governing codes and the Contract Documents. Where a recommendation or suggestion occurs in the referenced standards, such recommendation or suggestion shall be considered mandatory. In the event of conflict between referenced standards, this specification or within themselves, the more stringent standard or requirement shall govern.
- B. American Concrete Institute (ACI):
  - 1. ACI Special Publication SP-4, “Formwork for Concrete”.
  - 2. ACI 303.1, “Specification for Cast-In-Place Architectural Concrete”.

**1.3 SYSTEM DESCRIPTION**

- A. Concrete covered under this section includes Site Planters (CONC-02) and flatwork exposed to public on site (CONC-03)
- B. Refer to structural drawings for CONC-01
- C. Provide CONC-02 as described below and in drawings.
- D. Provide CONC-03 as described in Architectural and Civil Drawings.
- E. CONC-04 is existing concrete floor to be cleaned and sealed with sealer specified in section 2.07 of this specification.

#### **1.4 SUBMITTALS**

- A. Product Data: Submit for Architect's action. Furnish manufacturer's literature, specifications and installation instructions describing the general properties of each material and accessory to be used in the Work.
  - 1. Form Release Agent: Furnish data stating that the product will not stain the concrete surfaces and will not adversely affect the bond of subsequently applied finishes.
  - 2. Water Repellant Sealer: Furnish data stating that the product will not stain, darken or discolor the substrate surfaces and is explicitly recommended by the manufacturer for the intended application.
- B. Shop Drawings:
  - 1. CONC-02 Planters: Submit for Architect's action. Furnish diagrammatic drawings to confirm the formwork materials, and the profiles, sizes, locations and patterns of reveals, tie holes, rustications, and similar concrete surface design elements. Include elevations and section details to indicate the completed concrete. Include plans @ 1/2" = 1' and Details at 3" = 1'
  - 2. CONC-03 Site Flatwork: Submit layout drawings based on field verified dimensions showing patten, control joints, cold joints and pour sequence.
- C. Quality Control Submittals: Submit for Architect's information.
  - 1. Installer's Qualifications: Evidence of successful completion of work of similar scope to that shown and specified for this Project.

#### **1.5 QUALITY ASSURANCE**

- A. Qualified Installer: The architectural concrete work shall be performed by an installer having 5 years experience in the installation of specified materials on comparable projects and shall have been trained by and have the approval of the architectural concrete materials manufacturer.
- B. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from all such authorities.
- C. Mock-Ups: Provide a mock-up for of each type architectural concrete at a location to be designated by Architect. Build mock-up in accordance with ACI 303.1 requirements and as shown. Utilize the same materials, forming systems and installation methods in the mock-up as intended for the final Work, and include samples of simulated concrete repairs. Schedule the installation time so that the mock-up may be examined, and any necessary adjustments made, prior to commencing work for architectural concrete. Replace unsatisfactory items as directed and do not proceed until repair samples are accepted. When accepted, mock-up shall serve as the standard for materials, workmanship, and appearance for such Work throughout the project.



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- D. Pre-Installation Meeting: Within 30 days following award of the Contract, the Contractor shall schedule a meeting at a mutually agreeable time to include the Architect and designated representatives, the Contractor's superintendent, the concrete supplier and the formwork manufacturer to discuss materials, methods and forming systems for architectural concrete.

**PART 2 – PRODUCTS**

**2.1 FORMWORK, ABRASIVE BLASTED ARCHITECTURAL CONCRETE FINISH**

- A. Formwork Materials: One or more of the following materials and to result in no indication of the forming system on the finished surface after abrasive blasting.
1. Fiberglass Reinforced Plastic (GFRP): Fabricated by an experienced manufacturer acceptable to the Architect. Manufactured with a thixotropic isophtholic polyester resin, and contain not less than 32% fiberglass.
  2. Steel: Smooth, clean material fabricated by an experienced manufacturer acceptable to the Architect.
  3. Overlaid Plywood: "APA HDO Plyform Class I" Grade. Exterior type, high density overlay facing. Minimum 3/4 in. (19 mm) thickness. Size required to eliminate butt joints at other than rustications.
  4. Coated Plywood: "APA B-B Plyform Class I" Grade. Exterior type, sanded. Minimum 3/4 in. (19 mm) thickness. Not oiled. Treat the edges and casting face with a 2-component polyurethane form coating material applied in accordance with the manufacturer's recommendations. Fill boat patches and splits before applying the coating.

"Matte Finish" (The Burke Co.)

**2.2 FORM INSERTS, EMBEDMENTS AND ACCESSORIES**

- A. Fiberglass Form Ties: Engineered form tie system consisting of extruded fiberglass rod with gripper, wedge, spreader and waterstop devices.
- B. Form Ties: Plastic cone or washer type to be spaced in a uniform pattern. [Nominal 3/4 in. (20 mm) diameter.] Tie system and pattern shall be submitted for review by the Architect. Cones or washers shall completely cover the hole in the form.
- C. Rustication Strips: Wood or plastic. Milled straight, kerfed on the back face, without protruding splinters which may become embedded in the concrete. Size as indicated. Fully seal before application to the forms.
- D. Form Release Agent for Architectural Concrete: Non-staining, rust preventive coating which will not adversely affect the bond of subsequent surface coatings to concrete.

"Crete-Lease 880 Release Agent" (Cresset Chemical Company)





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**2.3 CONCRETE MIX DESIGN**

- A. General: Design architectural concrete mixes in cooperation with the Architect, based upon materials selected and reviewed by the Architect. Any change to the mix design after acceptance of mock-up, including admixture and cement brands, shall require a resubmittal of the mix design and construction of a new mock-up.

**2.4 MATERIAL AND PROPORTIONING REQUIREMENTS**

- A. General: Same materials and proportioning as normal weight structural concrete except as modified in this Section.
- B. Portland Cement: ASTM C150, Type I. [Gray]. Portland cement for architectural concrete shall be of domestic origin. Cement acceptance shall be based on the manufacturer's ability to produce a consistently uniform color. Cement shall be from the same mill and manufacturer, and furnished to ensure cement of uniform color.
  - 1. Mill certificates, including chemical analysis and results of physical tests, and color samples shall be submitted to the Architect when each shipment of cement is received by the concrete supplier.
- C. Mixing Water: Drinkable, tasteless, odorless.
- D. Aggregate: Aggregate for architectural concrete shall be clean, washed material and shall meet the requirements of ASTM C33 except as modified herein. The gradation and color of the aggregate shall be consistent. Aggregate not meeting these requirements shall be rejected.
- E. Water Reducing and/or Water Reducing Retarding Admixtures: Recommended architectural concrete dosages are in excess, normally by 50%, of those generally used for structural concrete.
- F. Color Admixture: ASTM C979, alkali resistant and fade resistant mineral oxide pigments, especially produced for integral coloring of Portland cement concrete. Provide in accordance with manufacturer's instructions and to obtain concrete color matching the appearance of the accepted samples.
  - "Chromix Admixture" (L. M. Scofield Co.)
  - "Mix Ready Colors" (Davis Colors)
- G. Slag and Fly Ash: Not permitted.
- H. Ground Granulated Blast Furnace (GGBF) Slag: Not permitted.
- I. Silica Fume: Not permitted.
- J. Dampproofing Admixture: Stearic acid based admixture to reduce concrete permeability. Use only with prior review and acceptance by Architect.
  - "Sikaproof 85" (Sika Chemical)
  - "Darapel" (W.R. Grace)



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**2.5 AUXILIARY MATERIALS**

- A. Silane Water-Repellant Sealer: Clear, colorless, penetrating water-based silane/siloxane water-repellant sealer. One of the following or equal:
  - “Baracade” (Euclid)
  - “Sure Klean Weather Seal SL GP” (ProSoCo Inc.)
- B. Detectable Warning Mats: Provide detectable warning mats as detailed on sheet C5.01 in federal yellow and in conformance with County of Santa Barbara requirements.
  - 1. Acceptable manufacturers are:
    - a. SafetyStep TD
    - b. Equaltile

**2.6 OWNER’S MONITORING ACTIVITIES**

- A. Owner’s Testing Agency: A testing agency, engaged at the Owner’s expense, will perform the following activities to monitor the Contractor’s Quality Control Program. The monitoring activities do not relieve the Contractor of sole responsibility for maintaining the Quality Control Program.
- B. Batch Plant Inspection: At the start, and midway through completion of architectural concrete work, observe the batching plant operation and evaluate the following in regard to compliance with the specified requirements. Furnish written report of the locations, sources, conditions, controls, and methods used.
  - 1. Inspect architectural concrete aggregate stockpiles and storage and bring to the attention of the concrete producer and the Architect any practices which are causing segregation or contamination within the stockpiles.
  - 2. Inspect trucks used to transport architectural concrete to assure that they are clean and in condition to mix and to deliver a uniform mix at a low slump.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Verification of Conditions: Examine the areas to receive the Work and the conditions under which the Work would be performed. Remedy conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

**3.2 FORMWORK**

- A. Tolerances: In addition to the provisions specified in Section 03 30 00 “Cast In Place Concrete,” comply with the following requirements.
  - 1. Irregularities: Maximum offset between butt joints of adjacent individual or ganged forms, 1/32 in. (0.8 mm).



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2. Cross Section Dimensions: -1/8 in. (-3 mm) and +1/4 in. (+6 mm).

**3.3 CONSTRUCTION JOINTS**

- A. General: Construction joints for architectural concrete shall occur with the rustication placed with first casting. Remove loose concrete dust and other fine material from the surface prior to the erection of forms. Hold formwork for the succeeding lift tight against the top of the previous lift, gasketed or sealed to prevent grout or paste leakage.

**3.4 PLACING OF REINFORCING STEEL**

- A. Concrete Coverage Over Reinforcing Steel, Including Ties: Not less than 2 in. (50 mm). Strict compliance to coverage requirements and bent bar details is required.
- B. Tie Wires: Cut as closely as possible to the bars, and bend behind the bars so that concrete placement will not force the wire ends to the exposed concrete surfaces.
- C. Reinforcing Bar Supports: Over exterior exposed beam bottoms and slab soffits, use stainless steel or steel with mushroom plastic capped legs of a color to match the finished concrete surface. Space uniformly and wire to the reinforcing to prevent movement during placement of concrete.
- D. Reinforcing Adjacent to Exposed Surface: Position and firmly hold in place by hangers, removable wedges or other means without the use of form-contact bar supports.

**3.5 PLACING OF CONCRETE**

- A. Truck Mixer Drums: Thoroughly clean prior to batching architectural concrete. Load only the capacity which will ensure a uniform batch at the slump specified. In the event that mixing is not uniform, the truck may either be rejected and not used on the Project, or if warranted, allowed to mix only batches which will assure delivery of a uniform concrete of the specified slump. Concrete shall be handled from the mixer to the place of final deposit as rapidly as practical by methods which prevent separation or loss of the ingredients. Distribute concrete by means of a bottom drop concrete bucket. The bucket shall have a capacity of not less than 1/2 yd<sup>3</sup> (0.4 m<sup>3</sup>). Clean the transporting and handling equipment at frequent intervals and flush thoroughly with water before and after each day's run.
- B. Place concrete in the forms within 1-1/2 hours after the water is added to the mixture. Do not place concrete when sun, temperature, wind or limitations of facilities furnished by the Contractor prevent proper finishing and curing.
- C. No concrete shall be placed in the forms after it has taken initial set. Retempering of concrete which has partially set is prohibited.
- D. Deposit concrete as close as possible to its final position to avoid rehandling. Deposit concrete in approximately uniform, horizontal layers not deeper than 18 in. (450 mm), taking care to avoid vertical joints or inclined planes. The piling up of concrete in forms in such a manner as to permit the escape of mortar, or the flow of the concrete itself, is not permitted. Deposit concrete continuously and as rapidly as practical until the entire unit of pour is completed. Consolidate concrete thoroughly by vibrating to ensure a dense, homogeneous mass without voids or pockets. Fill each part of the form by depositing

concrete directly as near as possible to the final position, and to force the concrete under and around the reinforcement without displacement. After the concrete has taken its initial set, avoid jarring the forms or placing strain on the ends of projecting reinforcement.

### **3.6 CONCRETE CONSOLIDATION**

- A. Do not spade concrete at finish surfaces (at the faces of formwork).
- B. Properly place and thoroughly consolidate concrete so that finish surfaces result in uniform finish free from irregularities. Vibrators shall be placed in concrete so as to penetrate approximately 6 in. (150 mm) into the previous lift of plastic concrete to minimize entrapped air between the concrete and the form and to blend the two layers.
- C. Vibrators shall be 2-1/4 in. (55 mm) to 2-5/8 in. (65 mm) diameter. Minimum frequency of vibrator shall be 9,000 impulses per minute. Two 180 cycle vibrators shall be used with a spare immediately available in case of breakdown. In certain sections, smaller diameter vibrators may be necessary.
- D. Do not allow vibrator head to come within 3 in. (75 mm) of the form face. Form vibrators are not allowed.

### **3.7 FORMED ARCHITECTURAL CONCRETE FINISHES**

- A. Curing and Patching: Moist cure in the forms. Make provisions to keep architectural concrete free from laitance caused by spillage, leaking forms or other contaminants. In no case shall laitance be allowed to penetrate, stain, or harden on finished surfaces. Surface patching or cleaning, if required, except for tie holes, shall not be attempted without the concurrence of the Architect.
- B. Corner Protection: Protect horizontal and vertical corners of columns and walls for full length or full height of exposed corner with continuous wood corner guards. Place wood corner guards immediately after stripping forms. Remove and replace guards as required after treatment and maintain until possibility of damage due to construction operations no longer exists.
- C. (CONC-02) Pattern Formed Architectural: Provide patterned architectural concrete finish obtained solely from the patterned faces of the concrete formwork.
  - 1. Tie Holes: Patch tie holes to match surrounding surfaces and strike off flush.

### **3.8 REPAIR OF CONCRETE**

- A. General: Areas to be repaired shall not exceed 2 ft<sup>2</sup> for each 1,000 ft<sup>2</sup> (1/500) of surface area and shall be widely dispersed. Repair patches shall be indistinguishable from the surrounding area.
- B. Trial Mix and Demonstration: Before commencing repairs, establish by trial mix a formula for the patching of the finish. Demonstrate patching on [sample panels.][the mock-up.] Demonstration of patching and its results shall be acceptable to the Architect before patching commences on the building.



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ARCHITECTURAL CONCRETE**

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**3.9 CLEANING AND SEALING**

- A. Laitance: Maintain architectural concrete free from laitance caused by spillage, leaking forms or other contaminants. Do not allow laitance to penetrate, stain, or harden on finished surfaces.
- B. Cleaning Surfaces to be Finish Coated: Clean with water or a liquid cleaner as required. Thoroughly rinse and allow to dry before application of finish coating. Apply liquid cleaners in strict accordance with the manufacturer's instructions including protective measures.
- C. Sealing: Clean the surfaces to be sealed and make free of dirt, dust, and other foreign material immediately prior to application of the sealer. Provide specified penetrating silane water-repellent sealer on exposed surfaces of concrete and apply undiluted in accordance with manufacturer's recommendations.

**END OF SECTION**

**SECTION 04 20 00  
UNIT MASONRY**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. General: Unit masonry is limited on project to repair and replacement in kind of existing units. Where masonry is replaced, provide new masonry in conformance with this specification.
- B. Related Work Specified Elsewhere:
  - 1. Section 01 81 13 "Sustainable Design Requirements" for additional references, definitions, documentation requirements, action plans, meetings, and performance requirements of products and systems.
  - 2. Dovetail slots embedded in concrete is furnished under this Section and installed under Section 03 30 00 "Cast-In-Place Concrete".
  - 3. Miscellaneous steel lintels, relieving angles, other support steel and accessories for unit masonry are specified in Section 05 50 00 "Metal Fabrications".
  - 4. Sheet metal flashing and trim is specified in Section 07 62 00 "Sheet Metal Flashing and Trim".
  - 5. Elastomeric flashing is specified in Section 07 65 00 "Elastomeric Flashing".
  - 6. Firestopping at heads and openings in masonry walls is specified in Section 07 84 00 "Firestopping".
  - 7. Sealants and joint fillers are specified in Section 07 92 00 "Joint Sealants".
  - 8. Steel doors and frames are furnished under Section 08 11 13 "Hollow Metal Doors and Frames" and installed under this Section.

**1.2 REFERENCES**

- A. General: Comply with the applicable provisions and recommendations of the referenced standards except as modified by governing codes and by the Contract Documents. Where a recommendation or suggestion occurs in the referenced standards, such recommendation or suggestion shall be considered mandatory. In the event of conflict between referenced standards, this specification or within themselves, the more stringent standard or requirement shall govern.
- B. American Concrete Institute (ACI): ACI 530/530.1/ASCE 6/TMS602 "Specifications for Masonry Structures" except exclude Sections 1.4 and 1.7; Parts 2.1.2, 3.1.2, and 4.1.2; and Articles 1.5.1.2, 1.5.1.3, 2.1.1.1, 2.1.1.2, and 2.3.3.9 and to modify Article 2.1.1.4 by deleting requirement for installing vent pipes and conduits built into masonry.
- C. ASTM International (ASTM):
  - 1. ASTM C90 "Standard Specification for Loadbearing Concrete Masonry Units".

2. ASTM C331 "Standard Specification for Lightweight Aggregates for Concrete Masonry Units"
  3. ASTM C33 "Standard Specification for Concrete Aggregates"
  4. ASTM C1586 "Standard Guide for Quality Assurance of Mortars".
- D. National Concrete Masonry Association (NCMA): "TEK" Information Series":

### **1.3 SYSTEM DESCRIPTION**

- A. Project Unit Masonry is generally limited to repair and immediate modification of areas called out in drawings. All new masonry shall match existing masonry units.

### **1.4 SUBMITTALS**

- A. Product Data: Submit, for Architect's action. Submit manufacturer's literature and specifications and installation instructions describing the general properties of each material and accessory to be used in the Work.
- B. Shop Drawings: Submit for Architect's action. Submit shop drawings for the fabrication and installation of the Work. Prepare details at not less than 3 in. = 1 ft. (1:5) minimum scale.
1. Submit shop drawings for fabrication, bending and placement of reinforcement bars and details for reinforced masonry. Comply with ACI 315 "Details and Detailing of Concrete Reinforcing". Submit bar schedules, stirrup spacing, bending diagrams for bars and arrangement of masonry reinforcement. Shop drawings shall bear the seal of a Structural or Civil Engineer registered in the state [in which the Project occurs].
- C. Samples: Submit for Architect's action. Label samples to indicate product, characteristics, and location in the Work. Samples will be reviewed for color and appearance only. Furnish sufficient samples to establish the full range of colors and textures for materials exposed in the finished Work. Compliance with other requirements is the responsibility of the Contractor.
1. Samples for CMU-01: Two Blocks Stacked with tooled grout joint to demonstrate fit and finish.
  2. Reinforcement and accessories embedded in the masonry: One of each.
  3. Special shapes of unit masonry: One of each.
- D. Quality Control Submittals: Submit the following, for Architect's information:
1. Test Reports:

- a. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to TMS 602/ACI 530.1/ASCE 6.
2. Certificates:
  - a. Document Review: Before commencing work, submit a written statement signed by the Contractor and the Installer certifying that the Contract Documents, shop drawings and product data have been reviewed with material manufacturers' qualified technical representatives and that they agree the selected materials are proper, compatible with contiguous materials and adequate for the application shown.
3. Manufacturer's Qualifications: Evidence that the specified materials have been manufactured by the same source and successfully utilized for a minimum of 5 years on projects of a similar scope to that shown and specified for this Project.

### **1.5 QUALITY ASSURANCE**

- A. Contractor's Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C1093 to conduct the testing indicated.
- B. Single-Source Responsibility: Obtain exposed unit masonry from one source of a single manufacturer. Obtain accessory products used in conjunction with masonry from the unit masonry manufacturer or from sources acceptable to the manufacturer.
- C. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from authorities having jurisdiction.
  1. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.
  2. Requirements for fire-rated or lateral support conditions are not necessarily fully defined on the Drawings or specified; comply with applicable regulations.

### **1.6 DELIVERY, STORAGE AND HANDLING**

- A. Packing, Shipping, Handling, and Unloading: Deliver masonry materials, other than bulk materials to Project site in manufacturer's unopened containers, bundles, pallets or other standard packaging devices; fully identified with name, type, grade, color and size.
- B. Storage and Protection: Store on platforms off the ground, in a dry location and protect from weather, soiling and damage. Store aggregates where grading and other required characteristics can be maintained and contamination avoided. Store masonry accessories including metal items to prevent corrosion and accumulation of dirt and oil. Do not use metal reinforcing, ties, or other components which are coated with loose rust or other deleterious matter that will reduce or destroy bond with mortar and grout.





**SECTION 04 20 00  
UNIT MASONRY**

**DIVISION 04**

**1.7 PROJECT/SITE CONDITIONS**

- A. Cold Weather Conditions: Do not erect masonry when the temperature is below 40 deg. F. (4.5 deg. C.) unless provisions for heating and drying the materials and protecting the completed work comply with the requirements specified in Paragraph 1.8 of ACI 530.1/ASCE 6/TMS 602 "Specifications for Masonry Structures". Do not build upon frozen work. Do not lay unit masonry having a film of water or frost on their surfaces.
- B. Hot Weather Conditions: Do not erect masonry when the temperature is above 100 deg. F. (38 deg. C.) or 90 deg. F (32 deg. C.) with a wind velocity greater than 8 mph (13km/h) to comply with the requirements specified Paragraph 1.8 of ACI 530.1/ASCE 6/TMS 602 "Specifications for Masonry Structures".

**PART 2 - PRODUCTS**

**2.1 UNIT MASONRY MATERIALS**

- A. Concrete Masonry Units (CMU-01): ASTM C90, modified as follows:
  - 1. Match Existing Masonry Units.
  - 2. Aggregates for Lightweight CMU: Lightweight, expanded shale, clay or slate produced by the rotary kiln method complying with ASTM C331 "Standard Specification for Lightweight Aggregates for Concrete Masonry Units", and graded from No. 4 to 0 to assure constant texture. The blending of screenings or other deleterious substances which will impair the fire ratings or insulation value of the unit is prohibited.
    - a. Lightweight CMU Density: The oven dry density of the concrete masonry unit shall not exceed 105 lbs./ ft<sup>3</sup> (1680 kg/m<sup>3</sup>).
  - 3. Aggregates for Normal Weight CMU: Complying with ASTM C33 "Standard Specification for Concrete Aggregates", and graded from No. 4 to 0 to assure constant texture. The blending of screenings or other deleterious substances is prohibited.
    - a. Normal Weight CMU Density: The oven dry density of the concrete masonry unit shall not exceed 125 lbs./ ft<sup>3</sup> (2000 kg/m<sup>3</sup>).
  - 4. Compressive Strength: Based on net area as follows:
    - a. Minimum compressive strength of one unit: 1700 psi (11.7Mpa)
    - b. Minimum average compressive strength of three units: 1900 psi (13Mpa).
  - 5. Curing: Low pressure steam cure at a pressure not to exceed 12 psi (83kPa). Raise the curing temperature uniformly at not more than 1 deg. per minute from 80 deg. F. (27 deg. C.) to a finish temperature of 180 deg. F. (83 deg. C.) and allow the unit masonry to reach equilibrium, approximately 3-1/2 hours from initial set period. Allow an interval (preset time) ranging from 2 to 5 hours between the

forming of the units and the curing process.

6. Face Size: Nominal 8 in. (200mm) x 16 in. (400mm), unless otherwise shown. Width or thickness as indicated.
  7. Linear Shrinkage: Not over 0.065% at delivery when tested in accordance with ASTM C426.
  8. Maximum Water Absorption
    - a. Lightweight CMU
      - 1) Maximum water absorption of one unit: 20 lbs./ ft<sup>3</sup> (320 kg/m<sup>3</sup>).
      - 2) Maximum water absorption of three units: 18 lbs./ ft<sup>3</sup> (288 kg/m<sup>3</sup>).
    - b. Normal Weight CMU
      - 1) Maximum water absorption of one unit: 15 lbs./ ft<sup>3</sup> (240 kg/m<sup>3</sup>).
      - 2) Maximum water absorption of three units: 13 lbs./ ft<sup>3</sup> (208 kg/m<sup>3</sup>).
  9. Provide special shapes where indicated and as follows:
    - a. For lintels, corners, jambs, sash, control joints, headers, bonding and other special conditions.
    - b. Provide square edged units for outside corners except as otherwise shown or specified.
  10. Exposed Units: Provide units for exposed construction with fine textured surface, sharp straight arises, and without chips, cracks or other defects on exposed edges or surfaces which would impair appearance.
- B. Precast Concrete Sills and Copings: Custom fabricated shapes, precast with air-entrained concrete and hot-dip galvanized steel reinforcing. ASTM C39, minimum 5500 psi (34.5MPa) compressive strength at 28 days ASTM C140, maximum 5% moisture absorption. Color and texture selected by Architect. Sizes and configurations as indicated

## **2.2 MORTAR AND GROUT MATERIALS**

- A. Portland Cement: ASTM C150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- B. White Portland Cement (For Face Brick): ASTM C150, Type I, domestic manufacturer, non-staining in accordance with the definition and test requirements of ASTM C91.
- C. Hydrated Lime: ASTM C207, Type S.
- D. Aggregate for Mortar: ASTM C144, except for joints less than 1/4 in. (6mm) use

aggregate graded with 100% passing the No. 16 (1.2mm) sieve. In areas requiring white mortar use natural white sand or ground white stone.

- E. Aggregate for Grout: ASTM C404.
- F. Admixtures: Set accelerators, anti-freeze compounds, mortar extenders and air-entraining and other admixtures are prohibited.
- G. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides of high purity, nonfading and limeproof, compounded for use in mortar mixes and in compliance with ASTM C979; color as selected. Use only pigments with record of satisfactory performance in masonry mortars.
- H. Water: Clear, potable and free of harmful amounts of acid, alkalies, salts, organic materials or other deleterious material which would impair the Work.

### **2.3 ANCHORS, REINFORCEMENT AND INSERTS**

- A. Anchors and Ties: ASTM A82 (A82M); Steel, hot-dipped heavily galvanized steel in accordance with ASTM A153 (A153M), Class B-2, conforming with ASTM A951 and complying with the following requirements:
  - 1. Partition Top Anchors: Provide hot dip galvanized steel partition top anchors developed to provide lateral shear resistance at the upper limit of the masonry walls and permitting vertical deflection of the slab above; Provide "#PTA420 Partition Top Anchor" and/or "#PTA422 Partition Top Anchor" (Hohmann & Barnard, Inc.) or approved equal. Provide at a maximum spacing of 48 in. and to resist a lateral force of 200 lbs./ft. or as otherwise noted on the drawings or as required.
  - 2. Anchor Bolts: 1/2 in. (13mm) dia., complying with ASTM A307, Grade A, hot-dipped galvanized in accordance with A153 (A153M), Class C; 12 in. (300mm) long with a 2 in. (50mm) turned leg, unless otherwise shown. Provide bolts with galvanized hex nuts and flat washers.
  - 3. Wire Ties: 10 ga. (3.5mm) looped at both ends.
  - 4. Wire Mesh Ties: 16 ga. (1.6mm), 1/2 in. (13mm) mesh, 3 in. (75mm) wide, length as required.
  - 5. Hardware Cloth: 16 ga. (1.6mm), 1/2 in. (13mm) mesh, size as required.
  - 6. Anchor Straps: 1-1/4 in. (32mm) x 1/8 in. (3mm) by length required, with ends turned up 2 in. (50mm)
  - 7. Horizontal Wire Reinforcement for Brick Veneer: 9 ga. (3.8mm) cold-drawn steel wire, complying with ASTM A82 (A82M), hot-dipped galvanized.
- B. Reinforcement:
  - 1. Rod Reinforcement: 1/4 in. (6mm) steel pencil rods free from mill scale and loose rust or other deleterious matter.



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2. Deformed Bar Reinforcement: ASTM A615 (A615M) steel, Grade 60 (Grade 420); hot-dipped galvanized in accordance with ASTM A123 (A123M) free from mill scale and loose rust or other deleterious matter. Provide sizes and spacing as shown.
- C. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding reinforcing bars in center of cells. Units are formed from 0.14 in. (3.6mm) steel wire, hot-dip galvanized after fabrication. Provide units with either two loops or four loops as needed for number of bars indicated. Provide one of the following:
  1. "D/A 810, D/A 812 or D/A 817" (Dur-O-Wal).
  2. "No. 376 Rebar Positioner" (Heckmann Building Products Inc.).
  3. "#RB or #RB-Twin Rebar Positioner" (Hohmann & Barnard, Inc.).
  4. "O-Ring or Double O-Ring Rebar Positioner" (WIRE-BOND).

**2.4 ACCESSORY MATERIALS**

- A. Expansion and Control Joint Fillers: Provide a system of joint fillers for unit masonry work of sizes and profiles shown. Provide fillers in joints to receive sealant sized to allow space for sealant and back-up materials.
  1. CMU Control Joints: ASTM D2000, Shore A Durometer 80 +/- 5. Preformed closed-cell synthetic rubber, size and shape intended for use with concrete masonry sash blocks, unless otherwise shown.
  2. Brick Control Joint: ASTM D1056, closed cell neoprene, capable of 35% compression.
- B. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity. Provide one of the following:
  1. "Mortar Break II" (Advanced Building Products Inc.).
  2. "DA1008 Mortar Net" (Dayton Superior Corporation, Dur-O-Wal Division).
  3. "Mortar Net" (Mortar Net USA, Ltd.).
  4. "Driwall Mortar Deflection" (Keene Building Products, Inc.).
- C. Metal Flashing Trim: Stainless steel, ASTM A167, Type 304, dead soft fully annealed except where harder temper required for forming or performance; 24 ga. (0.67mm) unless otherwise shown, finish No. 2D. Provide factory preformed and crimped edge. Comply with Section 07 62 00 "Sheet Metal Flashing and Trim".
- D. Insulation: Provide insulation specified in Section 07 23 00 "Building Insulation".
- E. Weepholes: Clear PVC tubing; 3/8 in. (9.5mm) dia, lengths as required; Provide one of the following:

1. "#341 Series Round Plastic Wrap Weepholes" (Hohman & Barnard Inc.).
- F. Weephole Ventilators: Aluminum with baked-on finish; heights as required; colors as selected by Architect; Provide "#343 W Wilko Weephole" (Hohmann & Barnard) or approved equal.
- G. Mastic Air and Vapor Barrier/Adhesive: Where masonry is below grade provide Trowel-applied, high solid, non-asphaltic elastomeric synthetic rubber mastic adhesive, suitable to adhere cavity insulation to substrates and compatible with cavity insulation and contiguous materials. Provide mastic barrier adhesive with a vapor permeance not to exceed 0.03 perms (1.7ng/Pa-s-m<sup>2</sup>) at 1/8 in. (3mm) wet thickness, when tested in accordance with ASTM E96.

## **2.5 MIXES**

- A. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
  1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C109 (ASTM C109M) for compressive strength, ASTM C1506 for water retention, and ASTM C91 for air content.
  2. Include test reports, according to ASTM C1019, for grout mixes required to comply with compressive strength requirement.
- A. Chloride Content of Mix: The total chloride (CL) ion content in the entire mortar or grout mix shall not exceed 0.10% of the weight of cement. Mortar and grout with excess chlorides will be subject to removal.
- B. Mortar for Unit Masonry: ASTM C270, Portland Cement-Lime Mortar; Type N for interior work and exterior wall work except use Type S mortar for reinforced unit masonry. Do not use quicklime or masonry cement for mortar.
  1. In mortar used for glazed concrete unit masonry, sand shall pass a No. 16 (1.2mm) sieve.
- C. Waterproof Mortar: For exterior solid wall construction, add mortar waterproofing admixture to the mix in accordance with the manufacturer's recommendation, but do not exceed 2% admixture by volume.
- D. Pigmented Colored Mortar: For pigmented mortars, use colored Portland cement-lime mix of formulation required to produce color indicated, or if not indicated, as selected from manufacturer's standard formulations. Pigments shall not exceed 10% of Portland cement by weight for mineral oxides nor 2% for carbon black. Provide individual mortar mixes to match the Architect's sample, containing mortar pigment for the following:
  1. Face Brick: Provide custom colors for each color and type of face brick scheduled, as selected by the Architect.
  2. Glazed Concrete Unit masonry: Provide custom colors for each color of glazed concrete unit masonry scheduled, as selected by the Architect.
- E. Fire Clay Mortar: For fire brick construction, mix in accordance with manufacturer's

recommendations.

- F. Grout: ASTM C476, Portland Cement Grout; provide individual mixes for fine aggregate grout and coarse aggregate grout as specified. Provide grout with a slump of 8 to 11 inches (200 to 280 mm) as measured in accordance with ASTM C143 (C143M).
- G. Measurement and Mixing of Mortar Materials: Comply with ASTM C270 for measuring and mixing of mortar materials and for retempering of mixed mortar. Measure and mix mortar to provide the following properties:
  - 1. Compressive Strength: Minimum 28-day strength as follows:
    - a. Type N: 750 psi. (5.2MPa).
    - b. Type S for Reinforced Masonry Only: 2500 psi.
  - 2. Water Retention: 75%, minimum.
  - 3. Air Content: 12%, maximum.
- H. Measurement and Mixing of Grout Materials: Comply with ASTM C476 for measuring and mixing of grout materials. Control batching procedure to ensure proper volume proportions of grout materials and to achieve a grout slump of 8 in. (200mm) to 11 in. (275mm), and a 28 day minimum compressive strength of 2500 psi (17.2MPa) in accordance with ASTM C1019.
- I. Measuring Devices: Use accurate measuring devices to mix materials by volume. The use of shovels for measurement is prohibited.
- J. Mixing of Pigmented Colored Mortars: Mix colored mortars separately to prevent contamination from other mortars.
- K. Mixture and Retempering Procedures: Mix only sufficient mortar as required at a given time. Retemper stiffened mortar as required, except discard mortar not utilized within 2 hrs. of initial mixing. Do not retemper colored mortar.

## **2.6 SOURCE QUALITY CONTROL**

- A. Contractor's Quality Control Responsibilities: Contractor is solely responsible for quality control of the Work.
- B. General: Provide and maintain an effective Quality Control program and perform sufficient inspections, surveys and tests of the Work, including those of other trades, to ensure compliance with the Contract Documents. Furnish appropriate facilities, accurately calibrated instruments and testing devices required to perform the quality control operations and with sufficient work forces to cover the construction operations within the actual construction sequences. Coordinate this work with the quality control requirements of other technical Sections of the Specifications and with requirements of the Owner and governing authorities having jurisdiction.
- C. Contractor's Testing: Perform testing in an independent certified testing laboratory. Furnish the laboratory sufficient quantities of specimens to comply with referenced testing standards. Test and furnish test reports for materials specified.



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1. Concrete Masonry Unit Testing: After the Architect's review of samples, test each type, class and grade of concrete masonry unit specified in accordance with ASTM C140. Provide testing specimens from actual production batches. Perform the following tests:
  - a. Compressive strength.
  - b. Absorption.
  - c. Moisture content.
  - d. Weight.
  - e. Dimensions.
2. Aggregate Testing: Test aggregate as follows:
  - a. Mortar Aggregate: ASTM C144.
  - b. Grout Aggregate: ASTM C404.
3. Mortar Testing: Test mortar samples in accordance with ASTM C780 for mortar compression strength, composition and properties. Test each mortar type and color each week. Prior to commencement of Work, provide preconstruction tests to establish a basis for comparison.
4. Grout Testing: Test and submit test reports of grout samples in accordance with ASTM C1019 for compression strength. Test grout during construction for each 5000 ft<sup>2</sup>. (465m<sup>2</sup>) of wall area or portion thereof. Prior to commencement of Work, provide preconstruction tests to establish a basis for comparison.
5. Chloride Ion Testing: Test each mortar and grout mix to verify that the total chloride (Cl) ion content of each mix is within the specified limits. Perform chloride tests in accordance with ASTM C1152 (C1152M).

**PART 3 - EXECUTION**

**3.1 GENERAL**

- A. Manufacturer's Instructions: Prepare substrates and erect the work of this Section, including components and accessories in accordance with the manufacturer's instructions, except where more stringent requirements are shown or specified, and where project conditions require extra precautions or provisions to ensure satisfactory performance of the Work.

**3.2 EXAMINATION**

- A. Verification of Conditions: Examine the areas to receive the Work and the conditions under which the Work would be performed. Remedy conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected. Examine rough-in and built-in construction to verify actual locations of

pipng and other connections prior to installation.

### **3.3 PREPARATION**

- A. Substrate Acceptability: Commencement of installation shall constitute acceptance of substrate conditions by the Installer
- B. Surface Preparation: Clean surfaces scheduled for unit masonry, before installation to remove dirt, dust, debris, loose material and other foreign matter detrimental to proper bonding.
- C. Lay Out of Walls: Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint widths and for accurate locating of openings, movement-type joints, returns, and offsets. Avoid the use of less-than-half-size units at corners, jambs, and where possible at other locations.

### **3.4 INSTALLATION**

- A. General Requirements: Provide unit masonry construction in accordance with the referenced standards and the manufacturers' recommendations for conditions of each particular application, except where more stringent requirements are shown or specified.
  - 1. Concrete Masonry: ACI 530 and ACI 530.1 standards.
- B. General : Lay masonry plumb, true to line with level and accurately spaced courses; corners plumb and true; each course breaking joint with the course below, except as may be otherwise indicated or specified. Maintain plumb bond. Comply with tolerances as specified in "References" and the following:
  - 1. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/4 in. (6mm) in 20 ft. (6m), nor 1/2 in. (13mm) maximum.
  - 2. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 in. (6mm) in 10 ft. (3m), or 1/2 in. (13mm), maximum.
  - 3. For conspicuous horizontal lines, such as exposed lintels, sills, parapets, and reveals, do not vary from level by more than 1/4 in. (6mm), in 20 ft. (6m), nor 1/2 in. (13mm) maximum.
  - 4. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8 in. (3mm), with a maximum thickness limited to 1/2 in (13mm). Do not vary from bed-joint thickness of adjacent courses by more than 1/8 in (3mm).
  - 5. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 in. (3mm). Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 in. (3mm).
- C. Leave openings for equipment to be installed before completion of masonry. After installation of equipment, complete masonry to match construction immediately adjacent to the opening.
- D. Stopping and Resuming Work: In each course, rack back 2-unit length for one-half





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running bond or 1/3-unit length for one-third running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay unit masonry lightly (if required), and remove loose unit masonry and mortar prior to laying fresh masonry.

- E. Condition of Exposed Masonry: No cracked, chipped, broken, discolored, defaced or open celled units will be permitted on exposed masonry.
- F. Cutting, patching and repairing in connection with masonry work as required to accommodate the work of other trades shall be performed under this Section.
- G. Use of Motor Driven Diamond Saw: Use motor driven diamond saw designed to cut unit masonry with clean sharp corners. Cut units as required to provide pattern shown and to fit adjoining work neatly. Use full units without cutting wherever possible. Avoid the use of less than half-size units at corners, jambs and at other locations.
- H. Joints: Tool exposed joints slightly concave unless otherwise shown. For surfaces to be plastered, rake joints to obtain bond. Lay masonry unit with uniform joint widths. Tool joints to squeeze mortar back into joints. Tool after mortar has taken its initial set. At inside face of exposed masonry air shafts, strike joints flush.
- I. Anchors and Ties: Provide loose anchors and ties where shown and where required to supplement other reinforcement specified and in accordance with the applicable requirements of governmental authorities having jurisdiction.
  - 1. Anchor, tie, reinforce and bond masonry at corners and intersections in accordance with the applicable requirements of governmental authorities having jurisdiction.
  - 2. Space loose anchors and ties a maximum of 16 in. (400mm) o.c. horizontally and vertically.
  - 3. Set anchors, with vertical legs, within the core of the masonry wythe and fill core solid with mortar or grout.
  - 4. Provide wire mesh ties, hardware cloth, or expanded lath below core space to retain mortar or grout at embedded anchors.
  - 5. Provide loose anchors at columns, beams and other structural elements as shown and as required to support imposed loads. Install anchors to structural elements to prevent rattle and lateral displacement in any direction.
- J. Flashing and Weep Holes: Install embedded flashing including weep holes if required, in masonry construction at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall as indicated and as specified.
  - 1. Prepare masonry and concrete surfaces so they are smooth and free from projections that could puncture flashing. Unless otherwise indicated, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
  - 2. At lintels and shelf angles, extend flashing a minimum of 4 in. (100mm) into masonry at each end. At heads and sills, extend flashing 4 in. (100mm) at ends

and turn flashing up not less than 2 in. (50mm) to form a pan. Protect flashing from damage during construction.

3. Extend sheet metal flashing 1/2 in. (13mm) beyond face of masonry at exterior and turn flashing down to form a drip.
  4. Install metal drip edges beneath elastomeric flashing at exterior face of wall. Stop elastomeric flashing 1/2 in. (13mm) back from outside face of wall and adhere to top of metal drip edge.
  5. Install weep holes in the head joints in exterior wythes of the first and second course (staggered) of masonry immediately above embedded flashing.
  6. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.
- K. Installation of Loose Lintels, Relieving Angles and Other Miscellaneous Support Steel: Install loose lintels, relieving angles and other miscellaneous support steel where shown. Adjust as required to provide square, level, plumb and true openings for attachment and alignment of other work. Grout lintels fully. Provide minimum lintel bearing at each jamb of 4 in. (100mm) for openings which do not exceed 6 ft. (1.8m) and 8 in. (200mm) for openings in excess of 6 ft. (1.8m).
1. Fill cores in hollow concrete unit masonry with grout 3 courses (24 in.) (600mm) under bearing plates, beams, lintels, posts, and similar items, unless otherwise shown.
  2. At underside of relieving angles and other miscellaneous support steel where shown or required, provide compressible filler.
- L. Built-In Work: Build in frames, struts, hangers, miscellaneous metal and other items of work furnished under other Sections. Prepare for, build in and protect flashings, reglets, anchors and other similar items occurring in connection with work of this Section. Set and grout loose lintels. Build in anchors, furnishing such as may be required exclusively by reason of work under this Section.
1. Access Doors, Frames and Access Panels: Install access doors, frames and access panels occurring in masonry construction where shown and required for access to mechanical and electrical installations and equipment.
  2. Chases, Slots, Reglets or Openings: Chases, slots, reglets or openings necessary for the proper installation of work of other trades shall be formed as required. Keep chases and reglets free from mortar or other debris.
- M. Mortar Cants: Provide mortar cants in where shown in drawings at planters concrete and/or steel beams abut and project from masonry walls.
- N. Pointing: At completion of any portion of work, point holes in joints of exposed masonry surfaces by completely filling with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application. After pointing has hardened clean the masonry surfaces. Clean masonry in small sections prior to the installation of contiguous work by other trades.

### **3.5 LAYING CONCRETE UNIT MASONRY**

- A. Procedures for Erection of Concrete Unit Masonry: Erect concrete unit masonry where shown. Solidly bed each course in mortar. Butter vertical joints their entire length. Lay concrete unit masonry with units in running bond with vertical joint in each course centered on units in courses above and below. Bond each course at corners and intersections and bond into or anchor to adjacent construction with metal anchors spaced not over 32 in. (800mm) o.c. in both directions. Do not use units with less than nominal 4 in. (100mm) horizontal face dimensions at corners or jambs.
- B. Matching Existing Masonry: Match coursing, bond, color, and texture of new masonry with existing masonry.
- C. Procedures for Setting Units: Set units with care around frames so as not to bulge the sides or change the position of the frames. Break joints in units set around the tops of door frames so as to minimize the danger of loosening the units due to door jarring. Set units tightly against metal frames and fill voids completely. Build frame anchors into joints. Cut units accurately to fit around pipes, ducts, openings, etc. and fill voids full. Fill jambs and head of hollow metal frames solid with mortar.
- D. Partitions: Build partitions to match existing. Give sufficient opportunity to the various trades to install built-in work before proceeding with the partitions, leaving openings where required for testing, etc.; such openings to be closed up later. Except where first course is shown to be laid on a concrete curb, lay first course directly on structural slab with cells vertical and fill cells with mortar to one-half the height of the unit. Construct masonry partitions full height and terminate against underside of structure above unless otherwise shown.
  - 1. Stop installation of partition, leaving a minimum gap of 3/4 in. (19mm) at top, to allow for deflection of floor slab. Fill void with continuous compressible filler of min. width 1 in. (25mm) less than width of concrete masonry unit, centered on unit leaving a 1/2 in. (13mm) gap on each side. Seal gap on both sides with sealant type shown. Sealants and compressible fillers are specified under Section 07 92 00 "Joint Sealants".
  - 2. In areas where walls are fire rated, stop installation of partition 3/4 in. (19mm) from top of structure above and leave ready for firestopping.
  - 3. Provide specified galvanized steel partition top anchors at top of CMU partitions in accordance with manufacturer's written instruction so as to laterally tie wall to structure and allow for deflection.
- E. Appearance of Work: Line up courses of exposed work throughout to obtain a uniform appearance. Install units at locations where conduits, pipes, etc. are to be enclosed in a manner to produce the regular jointing pattern of the adjacent surfaces. Provide necessary reinforcement for bonding where block units are used. Holes made in exposed units for attachment of handrail brackets and similar items shall be neatly drilled. Provide necessary special jamb, irregular and regular angle units where required to obtain smooth, evenly jointed and regular patterns throughout exposed surfaces.
- F. Joint Reinforcement: Place joint reinforcement in horizontal mortar joints on 16 in. (400mm) centers unless otherwise shown. Make reinforcement continuous except at

control joints and expansion joints. Lap reinforcement 6 in. (150mm) at ends and use prefabricated "T" and "L" sections at corners and intersections to provide continuity. Place reinforcement to obtain min. 5/8 in. (15mm) mortar cover at side rods. Provide reinforcement in first and second bed joints above lintels and below sills extending 2 ft. (600mm) beyond jamb openings.

- G. Control Joints: Construct continuous control joints to provide an unbroken vertical separation through the entire thickness of walls, in the manner shown by the details, complying with referenced standards and at locations shown. Locations of control joints not shown shall be approved by the Architect prior to the start of construction. Where locations are not shown, construct control joints throughout the unbroken length of walls as follows:
  - 1. Not to exceed 25 ft. (7.6m) on center in same plane as wall.
  - 2. Where joints occur in construction supporting masonry wall.
  - 3. Where masonry abuts dissimilar construction or structural element such as a column.
  - 4. At one jamb for major openings less than 6 ft. (1.8m) in width and at both jambs for wider openings. (Control joints can be omitted if adequate tensile reinforcement, as approved by the Architect, is placed above and below wall openings.)
  - 5. Where a change occurs in masonry wall height or thickness, and at chases and recesses in the masonry wall.
- H. Joint for Sealant: Leave an open joint for sealing entirely around metal frames in exterior and interior concrete masonry walls. Unless otherwise indicated on the Drawings, size of joint shall be 1/4 in. (6mm) wide and 3/4 in. deep, left clean and ready for sealing.
- I. Concrete Bond Beams and Lintels: Provide concrete bond beams and masonry lintels consisting of specially formed units, with reinforcing bars and fill with grout, wherever shown and wherever openings in concrete masonry of more than 1 ft. (300mm) are shown without structural steel or other supporting lintels. Unless otherwise shown provide one bar for each 4 in. (100mm) thickness of wall, and use bars of a size number not less than the number of feet of opening width. Provide minimum lintel bearing at each jamb of 4 in. (100mm) for openings which do not exceed 6 ft. (1.8mm) and 8 in. (200mm) for openings in excess of 6 ft. (1.8m). Precast lintels or form lintels in place with adequate temporary support. Cure precast lintels thoroughly before handling and installing.
- J. Miscellaneous Masonry Items: Install structural steel lintels and supports for unit masonry as indicated and as specified in Section 05 50 00, "Metal Fabrications". Build sleeves, frames, or other miscellaneous metal items into masonry, and fill solidly around each built-in item as Work progresses

### **3.6 REINFORCED UNIT MASONRY**

- A. Reinforcement Placement:
  - 1. Clean reinforcement of loose rust, mill scale, or other deleterious materials. Do



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not use reinforcement with kinks or reduced cross-section due to excessive rusting or other causes. Do not use reinforcement with bends other than shown on final shop drawings.

2. Position reinforcement accurately at spacing shown. Support and secure bars against displacement.
    - a. Provide laps of dimension shown; if not shown, as required by governing authority.
  3. Anchoring: Anchor masonry work to supporting structure as indicated. At intersection of reinforced masonry walls with non-reinforced masonry, provide anchorage as shown.
- B. Temporary Shoring: Provide temporary shoring as required to support masonry elements; to conform to masonry shapes, lines and dimensions shown.
- C. Installation of Reinforced Concrete Unit Masonry: Lay CMU units with full-face shell mortar beds. Use Type S mortar for reinforced unit masonry. Fill vertical head joints (end joints between units) solidly with mortar from face of unit to a distance behind face equal to not less than the thickness of longitudinal face shells. Solidly bed cross-webs of starting courses in mortar. Maintain head and bed joint widths shown, or if not shown, provide 3/8 in. (9mm) joints.
- D. Walls:
1. Pattern Bond: Lay CMU wall units in bond to match existing, unless otherwise indicated. Bond and interlock each course at corners and intersections. Use special-shaped units where shown, and as required for corners, jambs, sash, control joints, lintels, bond beams and other special conditions.
    - a. Maintain vertical continuity of core or cell cavities, which are to be reinforced and grouted, to provide minimum clear dimensions indicated and to provide minimum clearance and grout coverage for vertical reinforcement bars. Keep cavities free of mortar. Solidly bed webs in mortar where adjacent to reinforced cores or cells.
  2. Where horizontal reinforced beams (bond beams) are shown, use special units or modify regular units to allow for placement of continuous horizontal reinforcement bars. Place small mesh expanded metal lath or wire screening in mortar joints under bond beam courses over cores or cells of non-reinforced vertical cells, or provide units with solid bottoms.
  3. Grouting: Install grout in accordance with ACI 530.1/ASCE 6.
    - a. Use "Fine Grout" for filling spaces less than 3 in. (75mm) in both horizontal directions.
    - b. Use "Coarse Grout" for filling 3 in. (75mm) spaces or larger in both horizontal directions.

**3.7 OWNER'S MONITORING ACTIVITIES**

- A. Owner's Testing and Inspection Program: Testing and inspection will be performed, at



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time during the progress of the Work, by an independent testing agency retained by the Owner. Furnish materials and access to the Work as required by the Owner's Testing Agency.

**3.8 ADJUSTING**

- A. Remove and replace defective materials; correct defective workmanship; leave masonry clean.

**3.9 POINTING AND CLEANING**

- A. Removal of Excess Materials and Mortar Droppings: Execute work in as clean a manner as possible, removing excess materials and mortar droppings daily. Remove mortar droppings on connecting or adjoining work before it has attained final set.
- B. Cleaning of Concrete Masonry: Concrete unit masonry which are to remain exposed in the finished work shall be cleaned down daily at the end of each day's Work by the use of wire brushes or other method which will produce a satisfactory surface and in accordance with NCMA "TEK Note 45, Removal of Stains from Concrete Masonry Walls".
- C. Cleaning of Brick: Comply with "No. 20, Cleaning Brick Masonry" of the Brick Institute of America for masonry cleaning utilizing the "Bucket and Brush Method". Protect surfaces not intended to be cleaned.
  - 1. Face Brick: Wet brick surfaces exposed in the finished work and then clean with a diluted solution of muriatic (Hydrochloric) acid or proprietary cleaning solutions as recommended by the brick manufacturer. Solution strength by volume shall be as recommended by the brick manufacturer and as successfully utilized on the visual mock-up. Apply with stiff fiber brushes leaving the masonry clean, free of mortar daubs and with tight mortar joints throughout. The acid solution shall be controlled so as not to unduly come in contact with adjacent surfaces. Immediately after cleaning, the masonry surfaces shall be thoroughly rinsed down with clean water.
  - 2. Glazed Face Brick: Glazed surfaces shall be cleaned with soap powder and clean water, applied with stiff fiber brushes, leaving surfaces clean, free of mortar daubs and with tight mortar joints throughout.

**3.10 PROTECTION**

- A. General: Protect masonry from rain and snow until the work is complete and the mortar has set.
- B. Waterproof Covering: Protect on-going and completed portions of work with strong waterproof membrane well secured in place, or other suitable protective methods. Where one wythe of multi-wythe masonry walls is completed in advance of other wythes, secure waterproof cover a minimum of 24 in. (600mm) down face next to unconstructed wythe and hold cover in place.
- C. Loads: Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns
- D. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be



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left exposed or painted. Remove immediately grout, mortar, and soil that come in contact with masonry. Protect base of walls from rain-splashed mud and mortar splatter by means of coverings spread on ground and over wall surface. Protect sills, ledges, and projections from mortar droppings. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes from mortar droppings.

**END OF SECTION**

**SECTION 05 12 00  
STRUCTURAL STEEL FRAMING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section includes:
  - 1. Structural steel.

**1.2 REFERENCED STANDARDS**

- A. California Building Code (CBC), 2022 Edition.
- B. AISC's "Code of Standard Practice for Steel Buildings and Bridges."
- C. AISC's "Seismic Provisions for Structural Steel Buildings" and "Supplement No. 2."
- D. AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design as well as Load and Resistance Factor Design Specification for Structural Steel Buildings."
- E. AISC's "Specification for the Design of Steel Hollow Structural Sections."
- F. AISC's "Specification for Allowable Stress Design of Single-Angle Members and Specification for Load and Resistance Factor Design of Single-Angle Members."
- G. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

**1.3 SUBMITTALS**

- A. Comply with pertinent provisions of Section 01 3300 - Submittal Procedures.
- B. Product Data: For each type of product specified.
- C. Shop Drawings: Indicate detailing fabrication of structural steel components.
  - 1. Include erection plans, details of cuts, connections, splices, camber, holes and other pertinent data.
  - 2. Indicate welds by standard AWS Symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
  - 3. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify high-strength bolted slip-critical, direct-tension, or tensioned shear/bearing connections.





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4. Steel detailing shall be phased such that erection drawings ("E" sheets) are a separate submittal that includes inquiries of all required dimensional clarifications. Detailing of individual pieces ("D" sheets) shall not commence until "E" sheets are returned and clarifications are incorporated. Detailing resulting from this process shall be included in the bid.
  5. Indicate on the "E" sheets, in addition to the "D" sheets, the type of surface preparation of the individual pieces, such as shop primed, painted, or galvanized.
- D. Welding Procedure Specification (WPS): For each weld type used for the work, in conformance with AWS requirements.
- E. Qualification Data: For qualified fabricator.
- F. Mill Test Reports: Signed by manufacturers certifying that their products, including the following comply with requirements.
1. Structural steel, including chemical and physical properties.
  2. Bolts, nuts, and washers, including mechanical properties and chemical analysis.
  3. Shop primers.
- G. Fabricator Test Reports: Comply with ASTM A1011/A1011M.
- H. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.
- I. Designer's Qualification Statement.
- J. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

**1.4 QUALITY ASSURANCE**

- A. Installer Qualifications: Engage an experienced Installer who has completed structural steel work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Fabricator Qualifications: Engage a firm experienced in fabricating structural steel similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to fabricate structural steel without delaying the Work.
1. Fabricator must participate in the AISC Quality Certification Program and be designated an AISC-Certified Plant as follows:
    - a. Category: STD, Standard for Steel Building Structures.



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- C. Comply with applicable provisions of the following specifications and documents.
  - 1. AISC's "Steel Construction Manual", 15th Ed.
  - 2. AISC's "Seismic Provisions for Structural Steel Buildings."
  - 3. ASTM A6 (ASTM A6M) "Specification for General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use."
  - 4. Research Council on Structural Connections' (RCSC) "Specification for Structural Joints Using ASTM A325 or A490 Bolts."
- D. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code-Steel."
  - 1. Present evidence that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
- E. Fabricator Qualifications: A qualified steel fabricator that is accredited by the International Accreditation Service (IAS) Fabricator Inspection Program for Structural Steel in accordance with IAS AC172.
- F. Erector: Company specializing in performing the work of this section with documented experience.
- G. Design connections not detailed on drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in California.
- H. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1, Section 01 3000 - Administrative Requirements.

**1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver structural steel to Project site in such quantities and at such times to ensure continuity of installation.
- B. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration.
  - 1. Store fasteners in a protected place. Replace bolts and nuts that become dry and rusty before use.
  - 2. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.



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**1.6 SEQUENCING**

- A. Supply anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, templates, instructions, and directions, as required, for installation.

**PART 2 - PRODUCTS**

**2.1 STRUCTURAL-STEEL MATERIALS**

- A. Structural Steel Shapes (W and WT Shapes): ASTM A992 or A572, Grade 50 (Multi-Cert).
- B. Plates, Angles, and Channels: ASTM A36.UNO.
- C. Standard Steel Pipe Sections: ASTM A53, Grade B
- D. Hollow Structural Sections: ASTM A500, Grade B.
- E. Anchor Rods: ASTM F1554, Grade 36, UNO.
  - 1. Configuration: Straight, UNO.
  - 2. Nuts: ASTM A563 heavy hex carbon steel, UNO.
  - 3. Plate Washers: ASTM A36, UNO.
  - 4. Washers: ASTM F436 hardened carbon steel.
- F. Machine Bolts and Nuts: ASTM A307, Grade A.
- G. Welding Electrodes: Comply with AWS requirements.

**2.2 PRIMER**

- A. Shop Primer for Ferrous Metal: Organic zinc-rich primer, complying with SSPC-Paint 20 and compatible with topcoat.
  - 1. Primer for steel to receive a high-performance coating system shall be as specified in Division 9, Section 09 9600 - High-Performance Coatings.
- B. Field Primer for Ferrous Metal: Refer to 09 96 00 "High Performance Coatings" for primer.

**2.3 GROUT**

- A. Nonmetallic, Shrinkage-Resistant Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, Portland cement, shrinkage compensating agents,



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plasticizing and water-reducing agents, complying with ASTM C1107, of consistency suitable for application, and a 30-minute working time.

**2.4 FABRICATION**

- A. Fabricate and assemble structural steel in shop to greatest extent possible. Fabricate structural steel according to AISC specifications referenced in this Section and in Shop Drawings.
  - 1. Camber structural steel members where indicated.
  - 2. Identify high-strength structural steel according to ASTM A6 and maintain markings until steel has been erected.
  - 3. Mark and match-mark materials for field assembly.
  - 4. Fabricate for delivery a sequence that will expedite erection and minimize field handling of structural steel.
  - 5. Complete structural steel assemblies, including welding of units, before starting shop-priming operations.
  - 6. Comply with fabrication tolerance limits of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for structural steel.
- B. Thermal Cutting: Perform thermal cutting by machine only, unless approved by the Engineer.
  - 1. Plane thermally cut edges to be welded.
- C. Finishing: Accurately mill ends of columns and other members transmitting loads in bearing.
- D. Holes: Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members, where shown on drawings.
  - 1. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame-cut holes or enlarge holes by burning. Drill holes in bearing plates.
  - 2. Weld threaded nuts to framing and other specialty items as indicated to receive other work.

**2.5 SHOP CONNECTIONS**

- A. Where feasible, shop-install and tighten nonhigh-strength bolts, except where high-strength bolts are indicated.



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- B. Assemble and weld built-up sections by methods that will maintain true alignment of axes without warp.

**2.6 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. Galvanized surfaces.
  - 4. Surfaces to receive a high-performance coating system shall be prepared and primed as specified in Division 9, Section 09 9600 - High-Performance Coating System.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust, loose mill scale, and spatter, slag, or flux deposits. Prepare surfaces according to SSPC specifications as follows:
  - 1. SSPC-SP 3 "Power Tool Cleaning."
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's instructions and at rate recommended by SSPC to provide a dry film thickness of not less than 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
  - 1. Strip paint corners, crevices, bolts, welds, and sharp edges.
  - 2. Apply 2 coats of shop paint to inaccessible surfaces after assembly or erection. Change color of second coat to distinguish it from first.
- D. Painting: Apply a 1-coat, non asphaltic primer complying with SSPC's "Painting System Guide No. 7.00" to provide a dry film thickness of not less than 1.5 mils.

**2.7 FIELD PRIMING**

- A. All existing steel framing remaining installed shall be clean and primed with primer per section 2.02 and section 2.06B, 2.06C and 2.06D, including welds after compliance with inspections and tests per section 3.5.



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**2.8 GALVANIZING**

- A. Hot Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel indicated for galvanized according to ASTM A123.

**2.9 SOURCE QUALITY CONTROL**

- A. Owner's Representative will engage an independent testing and inspecting agency to perform shop inspections and tests and to prepare reports.
  - 1. Testing agency will conduct and interpret tests and state in each report whether test specimens comply with or deviate from requirements.
  - 2. Provide testing agency with access to places where structural steel work is being fabricated or produced so required inspection and testing can be accomplished.
- B. Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.
- C. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.
- D. In addition to visual inspection, shop-welded connections will be inspected and tested according to AWS D1.1 and the inspection procedures listed below, at Engineer's option.
  - 1. Liquid Penetrant Inspection: ASTM E165.
  - 2. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
  - 3. Radiographic Inspection: ASTM E94 and ASTM E142; minimum quality level "2-2T."
  - 4. Ultrasonic Inspection: ASTM E164.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Before erection proceeds, and with the steel erector present, verify elevations of concrete and masonry bearing surfaces and locations of anchorages for compliance with requirements.
- B. Do not proceed with erection until unsatisfactory conditions have been corrected.



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**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.

**3.3 ERECTION**

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC specifications referenced in this Section.
- B. Base and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.
  - 1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.
  - 2. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.
  - 3. Pack grout solidly between bearing surfaces and plates so no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.
    - a. Comply with manufacturer's instructions for proprietary grout materials.
- C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."
- D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
  - 1. Level and plumb individual members of structure.
  - 2. Establish required leveling and plumbing measurements on mean operating temperature of structure. Make allowances for difference between temperature at time of erection and mean temperature at which structure will be when completed and in service.
- E. Splice members only where indicated.
- F. Thermal Cutting during erection will be subject to Engineer's review and approval.



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- G. When thermal cutting in the field is permitted by the Engineer, then all such cut sections shall be finished to a sheared appearance acceptable to the Engineer.
- H. Do not enlarge holes in members by burning or by using drift pins. Ream holes that must be enlarged to admit bolts.

**3.4 FIELD CONNECTIONS**

- A. Install and tighten non high-strength bolts.
- B. Weld Connections: Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work.
  - 1. Comply with AISC specifications referenced in this Section for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
  - 2. Assemble and weld up built-up sections by methods that will maintain true alignment of axes without warp.

**3.5 FIELD QUALITY CONTROL**

- A. Owner's Representative will engage an independent testing and inspecting agency to perform field inspections and tests and to prepare test reports.
  - 1. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from requirements.
- B. Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.
- C. In addition to visual inspection, field-welded connections will be inspected and tested according to AWS D1.1 and the inspection procedures listed below, at Engineer's option.
  - 1. Liquid Penetrant Inspection: ASTM E165.
  - 2. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
  - 3. Radiographic Inspection: ASTM E94 and ASTM E142; minimum quality level "2-2T."
  - 4. Full Penetration and Groove Weld Inspection: Testing Laboratory shall inspect complete penetration and groove welds for connections of column to column, column to girder, girder to girder, and similar connections by ultrasonic testing or other approved non-destructive tests.





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5. Ultrasonic Testing: Testing Laboratory specially trained and fully qualified technician shall operate ultrasonic testing equipment, examine welds, and maintain a record of welds examined, defects found, and disposition of each defect. All defective welds shall be repaired and costs for retesting defective welds shall be paid by the Contractor.

**3.6 CLEANING**

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting.
  1. Apply by brush or spray to provide a minimum dry film thickness of 1.5 mils.
  2. For steel to receive a high-performance coating system, field touchup shall be as specified in Division 9, Section 09 96 00 - High-Performance Coating System.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and apply galvanizing repair paint according to ASTM A780.

**END OF SECTION**

**SECTION 05 50 00  
METAL FABRICATIONS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. General: Provide metal fabrications in accordance with requirements of the Contract Documents.
- B. Related Work Specified Elsewhere:
  - 1. Section 01 81 13 "Sustainable Design Requirements" for additional references, definitions, documentation requirements, action plans, meetings, and performance requirements of products and systems.
  - 2. Edge angles, and other such items is furnished under this Section and installed under Section 03 30 00 "Cast-in-Place Concrete".
  - 3. Loose lintels, relieving angles, anchor bolts and miscellaneous supports for masonry walls are furnished under this Section and installed under Section 04 20 00 "Unit Masonry".
  - 4. Decorative metal work specified in Section 05 70 00 "Decorative Metal Work".
  - 5. Finish painting is specified in Section 09 91 00 "Painting".
  - 6. High Performance Coatings" to be specified in Section 09 96 00 "High Performance Coatings".

**1.2 REFERENCES**

- A. General: Comply with the applicable provisions of the referenced standards except as modified by governing codes and the Contract Documents. Where a recommendation or suggestion occurs in the referenced standards, such recommendation or suggestion shall be considered mandatory. In the event of conflict between referenced standards, this specification or within themselves, the more stringent standard or requirement shall govern.
- B. ASTM International (ASTM)
  - 1. ASTM E894 "Standard Test Method for Anchorage of Permanent Metal Railing Systems and Rails for Buildings".
  - 2. ASTM E935 "Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings".
  - 3. ASTM E985 "Standard Specification for Permanent Metal Railing Systems and Rails for Buildings".
  - 4. ASTM E1481 "Standard Terminology of Railing Systems and Rails for Buildings".
  - 5. ASTM A276 "Standard Specification for Stainless Steel Bars and Shapes".



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- C. American Welding Society (AWS)
  - 1. AWS D1.1 "Structural Welding Code".
  - 2. AWS D1.2 "Structural Welding Code - Aluminum".
  - 3. AWS D1.3 "Structural Welding Code - Sheet Steel".
  - 4. AWS D1.6 "Structural Welding Code - Stainless Steel".
- D. Industrial Fasteners Institute (IFI): "Fastener Standards Book".
- E. National Association of Architectural Metal Manufacturers
  - 1. ANSI/NAAMM MBG 532 "Heavy Duty Metal Bar Grating Manual."
  - 2. NAAMM "Pipe Railing Manual".
  - 3. NAAMM "Metal Stairs Manual".
- F. The Society for Protective Coatings (SSPC): SSPC "Steel Structures Painting Manual, Volume 2, Systems and Specifications".

**1.3 SYSTEM DESCRIPTION**

- A. Performance Requirements
  - 1. Steel Ladders: Provide galvanized steel ladders as shown, designed and constructed to support a live load of 250 lbs./sq. ft. (12kPa) per rung.
    - a. Provide galvanized steel landing platforms designed to support a live load of 100 lbf/sq. ft. (4.8kPa) and a concentrated load of 300 lbf (1.3kN).
    - b. Provide industrial type steel ladders as shown, designed and constructed to support a live load of 100 lbf/sq. ft. (4.8kPa) and a concentrated load of 300 lbf (1.3kN).
  - 2. Railings, Guardrails and Supports: Design and construct for a concentrated load of 200 lbf (0.9kN) applied at any point and in any direction and for a uniform load of 50 lbs./ft. (730 N/m) applied in any direction. The concentrated and uniform loading conditions shall not be applied simultaneously.
  - 3. Gratings:
    - a. Unless otherwise shown, design gratings for a live load of 100 lbf/sq. ft. (4.8kPa) and a concentrated load of 300 lbf (1.3kN) on an area of 4 sq. in. (2580 mm<sup>2</sup>), whichever produces the greater stress. Limit deflection to L/360 or 1/4 in. (6mm), whichever is less.
  - 4. Temperature Change Provisions: Design, fabricate and install exterior components to provide for expansion and contraction over an ambient temperature range of 120 deg. F. (49 deg. C.) and a surface temperature range



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of 180 deg. F. (82 deg. C.) without buckling, undue stress on members or anchors, and other detrimental effects. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

5. Design Modifications: Make design modifications of work shown only as may be necessary to meet performance requirements and coordinate the work. Variations in details and materials which do not adversely affect appearance, durability or strength shall be submitted to the Architect for review. Maintain the general design concept without altering profiles and alignments shown.

### **1.4 SUBMITTALS**

- A. Product Data: Submit for Architect's action. Furnish manufacturer's technical literature describing the general properties of each product to be used in the Work. Include, manufacturer's technical data documenting the primary function, quality and performance of each system and containing specification for each material, load tables, dimension diagrams and installation instructions, or other such information as required by the drawings and specifications.
- B. Shop Drawings: Submit for Architect's action. Provide shop drawings detailing fabrication, installation, and erection of each metal fabrication item, including dimensioned plans and elevations, drawn at a minimum scale of 1 in. = 1 ft. (1:10) and details of sections, connections, anchorage and accessory items, drawn at a minimum scale of 3 in. = 1 ft. (1:5). Provide templates for anchors and bolts specified for installation under other Sections.
  1. Setting Drawings: Provide setting drawings and templates for the location of metal fabrications items that are to be embedded in or anchored to concrete or masonry.
- C. Structural Calculations: Submit, for Architect's information. Where installed metal fabrications are required to comply with certain design loadings, include structural computations, material properties, and other information needed for structural analysis that have been signed and sealed by a qualified Structural or Civil Engineer registered in the State where the project occurs who was responsible for their preparation.
- D. Quality Control Submittals: Submit the following for Architect's information:
  1. Reports: copies of welder pre-qualification and other welding procedures in form prescribed in AWS "Structural Welding Code".
  2. Installer's Qualifications: Evidence of successful completion of work of similar scope to that shown and specified for this Project.
  3. Manufacturer's Qualifications: Evidence that the specified materials have been manufactured by the same source and successfully utilized for a minimum of 5 years on projects of a similar scope to that shown and specified for this Project

### **1.5 QUALITY ASSURANCE**

- A. Qualified Installer: The metal fabrications work shall be performed by an Installer having

5 years experience in the installation of specified materials on comparable projects. The Installer shall have the approval of the metal fabrications materials manufacturer.

- B. Single-Source Responsibility: Obtain each type metal fabrication from one source of a single manufacturer and with sufficient production capacity to produce required units without causing delay to the Work. Obtain accessory products used in conjunction with metal fabrications from the metal fabrications manufacturer or from sources acceptable to the metal fabrications manufacturer.
- C. Gratings Manufacturer: A manufacturer specializing in the fabrication of the type of units required who has tested the units for load-bearing strength and deflection, and has currently published load tables based on recognized test procedures.
- D. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from authorities having jurisdiction.
- E. Pre-Installation Meetings: Prior to the start of the Work, meet at the Project site to review methods and sequence of metal fabrication installation, special details and conditions, standard of workmanship, testing and quality control requirements, job organization and other pertinent topics related to the Work.

## **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Storage and Handling: Store metal fabrications items under cover and off the ground. Handle in a manner so as to protect surfaces and to prevent distortion of, and any other type of damage to, fabricated pieces.

## **PART 2 - PRODUCTS**

### **2.1 METAL MATERIALS**

- A. Metal Surfaces, General: For metal fabrications work which will be exposed to view in the finished work, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness. Remove blemishes by grinding, or by welding and grinding, prior to cleaning, treating, and applying surface finishes.
- B. Steel
  - 1. Structural Steel Shapes, Plates and Bars: ASTM A36 (A36M).
  - 2. Rolled Steel Floor Plates: ASTM A786 (A786M) rolled from plate complying with ASTM A36 (A36M) or ASTM A283 (A283M), Grade C or D. Thickness shown for raised pattern safety plates is exclusive of projected pattern.
  - 3. Steel Tubing: ASTM A500; Cold-formed, welded or seamless process. For exterior use and other locations noted, provide hot-dip galvanized (minimum spangle) tubing in accordance with ASTM A153 (A153M).
  - 4. Steel Pipe: ASTM A53 (A53M), Type S, Grade B, suitable for close coiling, black finish unless galvanizing is required; standard weight (Schedule 40), unless



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otherwise indicated or required to satisfy performance criteria.

5. Steel Bars and Bar Size Shapes: ASTM A675 (A675M), Grade 65, or ASTM A36 (A36M).
  6. Cold Finished Steel Bars: ASTM A108, grade as selected by fabricator.
  7. Cold Rolled Carbon Steel Sheets: Commercial quality, or structural quality, complying with ASTM A1008 (A1008M), Grade A, unless another grade is required by design loads, stretcher leveled if exposed, free from scale, pitting or other defects.
  8. Galvanized Carbon Steel Sheets: ASTM A653 (A653M), hot-dip galvanized with G90 (Z275) coating (minimum spangle), either commercial quality or structural quality, Grade 33, unless another grade is required for design loads.
  9. Uncoated, Hot-Rolled Steel Sheet: Commercial quality, or structural quality, complying with ASTM A1011 (A1011M), Grade 30, unless another grade is required by design loads.
  10. Steel Wire: ASTM A510 (A510M).
- C. Aluminum: Provide alloy and temper recommended by aluminum producer or finisher for type of use and finish specified or shown, and with not less than the strength and durability properties of the alloy and temper designated below for each aluminum form required.
1. Extruded Bar and Shapes: ASTM B221 (B221M), 6063-T6.
  2. Extruded Pipe and Tube: ASTM B429 (B429M), 6063-T6.
  3. Plate and Sheet: ASTM B209 (B209M), 6061-T6.
  4. Aluminum-Alloy Rolled Tread Plate: ASTM B632 (B632M), aluminum alloy 6061-T4 for treads. Thickness shown for raised aluminum pattern plates is exclusive of projected pattern.
  5. Aluminum Finishes: Finish designations prefixed by "AA" conform to the system established by the Aluminum Association for designating aluminum finishes.
    - a. As Fabricated Finish: AA-M10; (Mechanical Finish as fabricated, unspecified).
- D. Stainless Steel: ASTM A240 (A240M); Provide the most suitable austenitic alloy, form and finish required to produce the Work. Provide Type 304 for interior and Type 316 for exterior, and low carbon Type 304L or 316L for components to be welded, unless otherwise noted.
1. Plate, Sheet and Strip: ASTM A666, stretcher level sheets.
  2. Bars and Shapes: ASTM A276.
  3. Round, Square and Rectangular Welded Tubing: ASTM A554, Grades MT 304,

MT 304L, MT 316, or MT 316L, as standard with manufacturer.

4. Pipe: ASTM A312 (A312M), Grade TP 304.
5. Castings: ASTM A743 (A743M), Grade CF8 or CF20.
6. Rolled-Stainless-Steel Floor Plate: ASTM A793 (A793M); thickness shown for raised pattern stainless steel plates is exclusive of projected pattern.

**E. Castings**

1. Gray Iron Castings: ASTM A48 (A48M), Class 30 unless another class is indicated or required by structural loads.
2. Malleable Iron Castings: ASTM A47 (A47M), Grade 32510.
3. Ductile Iron Castings: ASTM A536 (A536M), grade as selected by fabricator.
4. Abrasive Castings: Metal shown or specified, of suitable alloy for casting and for structural strength, with an evenly distributed exposed surface treatment of not less than 2 oz. per sq. ft. (610 g/m<sup>2</sup>) of abrasive granules. Provide electric furnace produced virgin aluminum oxide granules ranging in size from No. 16 to No. 24 and fired into the metal surface.

**2.2 FASTENER AND ANCHORAGE MATERIALS**

- A. Concrete Inserts and Anchors: Anchors and inserts capable of sustaining, without failure, the load imposed within a safety factor of 4 as determined by tested in accordance with ASTM E448. Threaded or wedge type, galvanized ferrous castings, either malleable iron ASTM A47 (A47M) or cast steel ASTM A27 (A27M). Provide bolts, washers and shims as required, hot dip galvanized, ASTM A153 (A153M), Class A.
- B. Fasteners and Anchorage Devices: Provide fasteners complying with the requirements of Industrial Fasteners Institute standards. Type, grade, class and style best suited for the respective purpose. Use countersunk flat-head Phillips type machine screws for exposed fasteners, except where Allen head screws are required. Use galvanized steel or stainless steel fasteners for exterior construction and for fastening components fabricated of galvanized steel.
  1. Provide Type 304 or 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, where built into exterior walls and fastening components fabricated of galvanized steel.
  2. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563 (A563M); and, where required, flat washers
  3. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts and, where required, flat washers; ASTM F593 for bolts and ASTM F594 for nuts.
  4. Aluminum: For fastening aluminum components use the following:
    - a. Aluminum Rivets: ASTM B316 (B316M), alloy 6053-T4 or 6061-T6.

- b. Fasteners for Aluminum Gratings: Use fasteners made of same basic metal as fastened metal except use galvanized fasteners complying with ASTM A153 (A153M) where specified or shown. Do not use metals that are corrosive or incompatible with metals joined.
  - 5. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E488, conducted by a qualified independent testing agency. Post-installed anchors in concrete used for component anchorage shall be prequalified for seismic applications in accordance with ACI 355.2, ICC-ES ACI93 or ICC-ES AC308. Post-installed anchors in masonry used for component anchorage shall be prequalified for seismic applications in accordance with ICC-ES AC01, AC58 or AC106.
    - a. Material for Indoor Conditions: Carbon-steel components zinc-plated to comply with ASTM B633, Class Fe/Zn 5.
    - b. Material for Exterior Conditions: Alloy Group 1 or 2 stainless-steel bolts complying with ASTM F593 and nuts complying with ASTM F594.
  - C. Non-metallic Shrinkage Resistant Grout: Premixed, prepackaged, nonmetallic, noncorrosive, nonstaining, non-gaseous, shrinkage resistant product containing selected silica sands, Portland cement, shrinkage compensating agents, plasticizing and water-reducing agents, complying with CE-CRD-C621 and ASTM C1107 Grade B or Grade C, free of gas-producing or gas-releasing agents, oxidizing catalysts, inorganic accelerators and chlorides. Grout shall be bleed free and attain 7,500 psi (51.7 MPa) compressive strength in 28 days at a fluid consistency of 20 to 30 seconds. Provide one of the following:
    - 1. "Five Star Grout" (U.S. Grout Corp.).
    - 2. "Masterflow 713 Plus" (.Chemrex Inc.).
    - 3. "Crystex" (L&M Construction Chemicals, Inc.).
    - 4. "Sure Grip Grout" (Dayton Superior).

## **2.3 PAINT AND COATING MATERIALS**

- A. General: Refer to 09 91 00 "Painting" and 09 96 00 "High Performance Coatings" for finishing requirements not listed here .
- B. Galvanizing Repair Paint: Zinc rich paint for repairing galvanized surfaces and field welds complying with requirements of ASTM A780. Thickness of applied galvanizing repair paint shall be not less than coating thickness required by ASTM A123 or ASTM A153 as applicable.
- C. Dielectric Separator: Cold applied, asphalt emulsion type complying with ASTM D1187, non-sagging, resistant to severe corrosion conditions; applied in two coats for an overall minimum dry film thickness of 25 mils (635 µm) or heavy coating of epoxy paint in minimum 2.0 mil (50µm) dry film thickness.



## **2.4 FABRICATION**

- A. **Supplementary Parts:** Include supplementary parts necessary to complete metal fabrications work though not definitely shown or specified. Such parts include, but are not limited to, interface components necessary for the installation or anchorage to Work.
- B. **Verification of Measurements and Dimensions and Coordination and Schedule of Work:** Verify measurements and dimensions at the job site and cooperate in the coordination and scheduling of the work of this Section with the work of related trades (with particular attention given to the installation of items embedded in concrete and masonry).
- C. **Formation of Exposed Work:** Form exposed work true to line and level with accurate angles and surfaces and straight crisp edges. Ease exposed edges to a radius of approximately 1/32 in. (0.8mm), unless otherwise shown. Form bent metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. **Formation of Exposed Connections:** Form exposed connections with hairline joints, flush and smooth; using concealed fasteners where possible. Exposed threaded portion of bolts and screws shall be cut off flush with adjacent metal. Cut, drill, punch and tap as required for the installation and attachment of other work to metal fabrications work. Shear and punch metals cleanly and accurately. Remove burrs. Remove sharp or rough areas on exposed traffic surfaces.
- E. **Formation of Metal Work:** Form metal work built in with concrete or masonry for anchorage, or provide suitable anchors, expansion shields, or other anchoring devices shown or required to provide support for intended use. Furnish metal work in ample time for setting and securing in place.
- F. **Procedures for Joints and Welds:** Make joints as strong and rigid as adjoining sections. Make welds continuous along entire line of contact, except where spot welding is indicated. Grind exposed welds flush and smooth to match and blend with adjoining surfaces. Welded connections may be used where bolted connections are shown. Fabricate joints exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.
  - 1. Make up threaded connections tight so that threads are entirely concealed. Shoulder and head, dowel and pin abutting bars. Provide bolt and screw heads flat and countersunk in exposed work. Carefully machine, fit and secure removable members by means of Allen-head set screws of proper size and spacing.
- G. **Galvanizing**
  - 1. ASTM A153 (A153M), Classes A and B, for galvanizing iron and steel hardware.
  - 2. ASTM A123 (A123M), for galvanizing rolled, pressed and forged steel shapes, plates, bars, strip 1/8 in. (3mm) thick and heavier and for assembled steel products.
  - 3. Items to be Galvanized: Galvanize ferrous metal utilized on the exterior and items embedded in concrete whether interior or exterior, unless otherwise specified. Galvanize other items where specified or shown.



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- H.      Preassembly of Items: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Following trial fit, disassemble units only as necessary for shipping and handling. Clearly mark units for reassembly. Provide alignment and splice plates for accurate field fit.

**2.5      RAILINGS, GUARDRAILS AND SUPPORTS**

- A.      Refer to 05 70 00 "Decorative Metals" for handrails.

**2.6      GRATINGS**

- A.      General: Provide galvanized steel gratings or aluminum gratings where indicated, including supplementary framing and supports. Provide gratings of pressure lock type construction, rectangular pattern, with plain surface top bars in the same plane; accurately fabricated free from warps, twists or other defects affecting their serviceability or appearance.
- B.      Provide removable grating sections where shown, with end-banding bars for each panel and each opening, saddle clip anchors designed to fit over bearing bars, and stud bolts with washers and nuts, unless otherwise shown.
- C.      Provide cutouts in grating sections for penetrations indicated. Edge band openings in grating that interrupt 4 or more bearing bars with bars of same size and material as bearing bars.

**2.7      OPENING FRAMES, GUARDS AND COVERS**

- A.      Opening Frames, Guards And Curbs: Provide frames and strips of the sizes, shapes and profiles shown or, if not shown, of the required dimensions to receive adjacent grating, plates, doors or other work to be retained by the framing. Fabricate from structural steel shapes and plates and steel bars, using welded construction with mitered corners, welded brackets and splice plates and a minimum number of joints for field connection. cut, drill and tap units to receive hardware and similar items to be anchored to the work.
1.      Anchors: Equip units with integrally welded anchor straps for casting into concrete or building into masonry. Unless otherwise noted, space anchors 24 in. (600mm) o.c., and provide minimum 1/4 in. (6mm) thick anchor units of 1-1/4 in. (32mm) x 8 in. (200mm) steel straps.
- B.      Pipe Guards: Provide pipe guards at locations susceptible to vehicular damage of 3 in. (75mm) x 3 in. (75mm) x 5/16 in. (7mm) steel angles, extending from floor to 3 ft.-6 in. (1m) above floor. Provide with 3/8 in. (9mm) steel base plates for bolting to floor, and with 1/4 in. (6mm) x 2 in. (50mm) steel strap braces at top. Provide at least 2 vertical angles at each location, except at internal corners, and extend strap between angles and from each angle to wall or column.
- C.      Pipe Guards: Custom fabricate to the sizes, shapes and profiles shown using bent steel plate or steel shapes as indicated. Provide system for anchoring into structure.
- D.      Edge Angles
1.      Provide edge angles of size as shown, with welded-on strap or stud anchors 2 ft.



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(600mm) on centers.

2. Provide angles in as long lengths as possible. Miter and weld corners and provide splice plates for alignment between sections.
- E. Trench Drain Covers: Trench drain assemblies, gratings and frames fabricated from heavy duty ductile iron castings or gray iron castings designed for vehicular loads, of size as shown. Provide units with continuous machined surfaces, integral anchors, outlet pipes, end closures, bolts, and machined joints. Provide "Type R-4996 with Grating Type P" (Neenah Foundry Co.), or similar type by McKinley Iron Works, or J.R. Smith Manufacturing Co.

**2.8 SUPPORTS FOR MASONRY (IF REPLACEMENT IS REQUIRED)**

**A. Loose Lintels**

1. Furnish loose steel lintels as shown and/or as required over openings in masonry walls, partitions and shafts. Include lintels for mechanical openings as required. Furnish lintels 16 in. (400mm) longer than the opening widths. Where metal door frames are provided with integral head reinforcement, furnish loose lintels only for openings 3 ft. 4 in. (1m) wide and wider. Weld adjoining members together to form a single unit where indicated. Shop finish with exterior ferrous metal primer system as specified.
2. Do not utilize loose steel lintels in walls that are scheduled as "Fire Rated" with openings greater than 4 ft. (1.2m.) Use reinforced concrete masonry units as specified in Section 04 20 00 "Unit Masonry".
3. Unless otherwise shown, provide lintels in accordance with the following schedule:

Opening Width (Max.)	4 in. Wall	6 in. Wall	8 in. Wall*	10 in. and 12 in. Wall*
2 ft.	3-1/2 x 3-1/2 x 1/4	5 x 5 x 5/16	3-1/2 x 3-1/2 x 1/4	8 x 4 x 1/2
3 ft.	3-1/2 x 3-1/2 x 1/4	5 x 5 x 5/16	3-1/2 x 3-1/2 x 1/4	8 x 4 x 1/2
4 ft.	3-1/2 x 3-1/2 x 1/4	5 x 5 x 5/16	3-1/2 x 3-1/2 x 1/4	8 x 4 x 1/2
5 ft.	3-1/2 x 3-1/2 x 1/4	5 x 5 x 5/16	3-1/2 x 3-1/2 x 1/4	8 x 4 x 1/2
6 ft.	3-1/2 x 3-1/2 x 1/4	5 x 5 x 5/16	3-1/2 x 3-1/2 x 1/4	8 x 4 x 1/2
7 ft.	3-1/2 x 3-1/2 x 1/4	5 x 5 x 5/16	3-1/2 x 3-1/2 x 1/4	8 x 4 x 1/2
8 ft.	4 x 3-1/2 x 1/4	5 x 5 x 5/16	4 x 3-1/2 x 1/4	8 x 4 x 5/8



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Opening Width (Max.)	100mm Wall	150mm Wall	200mm Wall*	250mm and 300mm Wall*
0.6m	90mm x 90mm x 6mm	125mm x 125mm x 7.5mm	90mm x 90mm x 6mm	200mm x 100mm x 13mm
0.9m	90mm x 90mm x 6mm	125mm x 125mm x 7.5mm	90mm x 90mm x 6mm	200mm x 100mm x 13mm
1.2m	90mm x 90mm x 6mm	125mm x 125mm x 7.5mm	90mm x 90mm x 6mm	200mm x 100mm x 13mm
1.5m	90mm x 90mm x 6mm	125mm x 125mm x 7.5mm	90mm x 90mm x 6mm	200mm x 100mm x 13mm
1.8m	90mm x 90mm x 6mm	125mm x 125mm x 7.5mm	90mm x 90mm x 6mm	200mm x 100mm x 13mm
2.1m	90mm x 90mm x 6mm	125mm x 125mm x 7.5mm	90mm x 90mm x 6mm	200mm x 100mm x 13mm
2.4m	100mm x 90mm x 6mm	125mm x 125mm x 7.5mm	100mm x 90mm x 6mm	200mm x 100mm x 6mm

\* Furnish two angles at all openings in 8 in. (200mm), 10 in. (250mm) and 12 in. (300mm) walls. Furnish a lintel angle for each masonry wythe.

- C. Loose Bearing and Leveling Plates: Provide galvanized steel loose bearing and leveling plates for steel items bearing on masonry or concrete construction, fabricated flat, free from warps or twists and of required thickness and bearing area. Provide integral anchorages as indicated or if not indicated as required for a complete installation.
- D. Shelf and Relieving Angles: Furnish shelf and relieving angles fabricated from steel angles of sizes indicated and for attachment to concrete framing. Provide slotted holes to receive 3/4 in. (19mm) dia. bolts, spaced not more than 6 in. (150mm) from ends and not more than 24 in. (600mm) on center, unless otherwise shown or specified. Shop finish with exterior ferrous metal primer system specified.
  - 1. Fabricate units in convenient lengths from field measurements for each location of use, provide joint gaps in angles at locations of masonry control joints and expansion joints. Size joint gaps to match width of the masonry joints in the location of use. Provide joints in other locations, as required for fabrication only, with tight joints.
  - 2. Provide slotted holes to allow adjustment of shelf and relieving angles to building substrates and to allow for proper installation of masonry elements.
  - 3. Provide units at corners and other transitions fabricated into one piece.
  - 4. Provide units shop primed and shop finish painted on all surfaces after fabrication.

### 2.9 BICYCLE RACKS

- A. Provide Bicycle Rack as indicated in 12 50 00 "Site Furnishings"

### 2.10 MISCELLANEOUS FRAMING AND SUPPORTS

- A. Steel Framing, Subframing and Supports: Provide steel framing and subframing and supports for applications shown and not specifically provided as part of the work of other



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trades.

- B. Steel Weld Plates and Angles: 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 not less than two integrally welded steel strap anchors for embedding in concrete.
- C. Items Required for Framing and Supporting Woodwork and Other Types of Items: Furnish bent, or otherwise custom-fabricated, bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required for framing and supporting woodwork and other type items, and for anchoring or securing woodwork and other type items, to concrete or other structures. Fabricate items to sizes, shapes, and dimensions required. Furnish malleable-iron washers for heads and nuts that bear on wood structural connections, and furnish steel washers elsewhere.
- D. Fabrication of Miscellaneous Units: Fabricate miscellaneous units to sizes, shapes and profiles shown or, if not shown, of required dimensions to receive adjacent work to be retained by framing. Fabricate from structural steel shapes and plates and steel bars, of welded construction using mitered joints for field connection, except where otherwise shown. Cut, drill and tap units to receive hardware and similar items.
- E. Anchors and Inserts: Provide units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed.
  - 1. Space anchors 24 in. (600mm) o.c. and provide minimum anchor units of 1-1/4 in. (32mm) x 8 in. (200mm) x 3 in. (6mm) steel straps, except as otherwise shown.
- F. Steel Tube Supports for Countertops: Utilize steel tube supports sized to support dead loads of countertops, and in addition a uniform live load of 300 psf (14.4 kPa). Where exposed in the finish work, provide welded connections, ground smooth and primed for field painting specified in Section 09 91 00, "Painting". Where concealed, utilize bolts and connectors of capacity required to support imposed live and dead loads. Anchor steel tubes to structural walls and slabs as required for a secure and rigid installations. Fasten tubes to countertops with fasteners applied through the tubes into the underside of tops, and in sufficient quantity for a secure installation.
  - 1. Floating Countertop Wall Bracket ([Ironsupports.com](http://Ironsupports.com))
- G. Framing For Suspended Toilet Compartments
  - 1. Provide continuous steel framing for toilet partition supports, coordinated with the toilet partitions and including provisions for partition anchorage as required to sustain imposed loads and to limit deflections to L/360 between hangers.
  - 2. Provide steel rods, 1/2 in. (13mm) dia., spaced not more than 36 in. (900mm) o.c. Thread rods to receive anchor and stop nuts. Fit hangers with wedge shape washers for full bearing on sloping flanges of support beam.
  - 3. Coordinate installation with toilet partition manufacturer's written instructions and recommendations.

**2.11 SHOP CLEANING AND PAINTING**

- A. Metal Fabrications Work: Shop paint metal fabrications work, except members or portions of members to be embedded in concrete or masonry, surfaces and edges to be field welded and stainless steel, unless otherwise specified.
- B. Removal Of Oil, Grease And Similar Contaminants: Remove oil, grease and similar contaminants in accordance with SSPC SP-1 "Solvent Cleaning", prior to additional surface preparation specified.
- C. Metal Surfaces: Clean and prepare metal surfaces before applying shop coat. Remove rust and mill scale in accordance with SSPC SP-3 "Power Tool Cleaning" for interior exposed ferrous metal and SSPC SP-6 for exterior exposed ferrous metal.
- D. Application of Primer: Immediately after surface preparation, apply primer in accordance with manufacturer's instructions. Use painting methods, which will result in full coverage and dry film thickness specified.
- E. Procedures for Primer and Finish Paint: Refer to 09 91 00 "Painting" and 09 96 00 "High Performance Coatings" specification for requirements. The entire coating system shall be as supplied by a single manufacturer.
- F. Dissimilar Materials: Separate dissimilar metals with coating of dielectric separator. Do not extend coating onto exposed or finished surfaces.

**2.12 SOURCE QUALITY CONTROL**

- A. Contractor's Quality Control Responsibilities: Contractor is solely responsible for quality control of the Work.
- B. Contractor's Inspection and Testing Agency: Contractor shall employ, at its own expense, an independent full time inspection agency to perform testing and inspection services for metal fabrication work as follows. Non-conforming Work shall be retested and paid for by Contractor.
- C. Shop Inspection of Connections: Perform 100% visual inspection at bolted and welded connections in the Work. Examine the size, quality and placement of each connection to verify installation in accordance with Contract Documents and actioned shop drawings.

**PART 3 - EXECUTION**

**3.1 GENERAL**

- A. Manufacturer's Instructions: Prepare substrates and install the work of this Section, including, components and accessories in accordance with the manufacturer's instructions, except where more stringent requirements are shown or specified, and where project conditions require extra precautions or provisions to ensure satisfactory performance of the Work.

**3.2 EXAMINATION**

- A. Verification of Conditions: Examine the areas to receive the Work and the conditions under which the Work would be performed. Contractor shall remedy conditions



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detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

**3.3 COORDINATION**

- A. Coordinate installation of anchorages for metal fabrications. 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.
- B. Coordinate installation of steel weld plates and angles for casting into concrete that are specified in this Section but required for work of another Section. Deliver such items to Project site in time for installation.
- C. Coordinate stair nosing anchor types with cast-in-place work. Coordinate non-cast anchor types with indicated substrate. Ensure that replaceable abrasive inserts can be replaced as required.

**3.4 PREPARATION**

- A. Substrate Acceptability: Commencement of installation shall constitute acceptance of substrate conditions by the Installer

**3.5 INSTALLATION**

- A. General: Install work as shown, plumb, level and in line with adjacent materials where required. Provide fastenings as indicated on the Drawings, specified herein or as shown on final shop drawings. Fit exposed connections accurately together to form tight hairline joints.
  - 1. Steel Weld Plates And Angles: Coordinate installation of steel weld plates and angles for casting into concrete construction that are specified in this Section but required for work of another Section. Deliver such items to Project site in time for installation.
  - 2. Anchorages: Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions and directions for installation of anchorages, including steel weld plates and angles, concrete inserts, sleeves, anchor bolts and other miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to the project site. Deliver items which are to be built into the work of other Sections in time so as not to delay the progress of the Work.
- B. Procedures for Fastening Metal Work: Except where otherwise specified for a particular item for built-in work, fasten metal work to concrete or solid masonry with embedded anchors or expansion bolts, and to hollow block with toggle bolts. Fastening to wood plugs will not be permitted. Drill holes for bolts to the exact diameter of the bolt. Provide screws threaded full length to the screw head.
- C. Field Welding: Comply with AWS Welding Code for procedures related to field welding as related to appearance and quality of welds made and for methods used in correcting welding work. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals. Obtain fusion without undercut or overlap.





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Remove welding flux immediately. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.

- D. Protection of Finished Surfaces: Protect finished surfaces against damage during construction and remove protection at time of substantial completion.
- E. Dissimilar Materials: Separate dissimilar metals with heavy coating of dielectric separator. Do not extend coating onto exposed or finished surfaces.
- F. Procedures for Securing Vertical Ladders: Secure vertical ladders to masonry or concrete with a minimum of two 1/2 in. (13mm) diameter expansion bolts at each bracket, unless additional attachments are required to sustain imposed loads.
- G. Gratings: Install grating in accordance with requirements of ANSI/NAAMM MBG 531 "Metal Bar Grating Manual" including installation clearances and standard anchoring details. Weld gratings to supporting steel, except for sections which are hinged or required to be removable. Secure removable units to supporting members with type and size of clips and fasteners as recommended by grating manufacturer for type of installation conditions shown. Do not notch bearing bars at supports to maintain elevation. Secure toe plates to gratings by welding.
- H. Loose Plates: Prior to setting loose bearing and setting plates, clean concrete and masonry bearing surfaces of bond reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates. Set on wedges or other adjustable devices. After members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the plate before packing with grout. Pack grout solidly between bearing surfaces and plates to ensure no voids remain.
- I. Installing Bicycle Racks: Anchor bicycle racks to structural footing below permeable pavers with expansion anchors or concrete screws per manufacturer's recommendation. Repair waterproofing after installation.

**3.6 FIELD QUALITY CONTROL**

- A. Contractor's Quality Control Responsibilities: Contractor is solely responsible for quality control of the Work.
- B. Connection Identification: Assign each bolting crew and welder an identifying symbol, and require them to mark every connection, so that an inspector may identify the person(s) making each connection.
- C. Qualification for Field Welding: Qualify the welding operators and welding procedures in accordance with AWS D1.1 and D1.3 requirements.
- D. Field Inspection of Connections: Perform 100% visual inspection at bolted and welded connections in the Work. Examine the size, quality and placement of each connection to verify installation in accordance with Contract Documents and actioned shop drawings.





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**3.7 ADJUSTING**

- A. Procedures for Cleaning, Painting and Touch-Up: Immediately after erection, clean field welds, bolted connections, marred and abraded surfaces. Paint and touch-up paint with the specified paint system. Touch up galvanized surfaces in accordance with ASTM A780.

**END OF SECTION**

**SECTION 05 70 00  
DECORATIVE METAL**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. General: Provide decorative metals in accordance with requirements of the Contract Documents.
- B. Related Work Specified Elsewhere:
  - 1. Section 01 81 13 "Sustainable Design Requirements" for additional references, definitions, documentation requirements, action plans, meetings, and performance requirements of products and systems.
  - 2. Non-decorative metal fabrications specified in Section 05 50 00 "Metal Fabrications".
  - 3. Railings other than decorative are specified in Section 05 50 00 "Metal Fabrications".
  - 4. Decorative metal work specified in Section 06 40 00 "Architectural Woodwork".
  - 5. Steel doors and frames are furnished under Section 08 11 13 "Hollow Metal Doors and Frames" and clad with stainless steel under this Section.
  - 6. Sheet Metal Grounds (Backer Plates) for anchoring decorative metal items on gypsum drywall partitions is specified in Section 09 21 17 "Gypsum Board Systems".
  - 7. Finish painting is specified in Section 09 91 00 "Painting".
  - 8. Decorative lighting fixtures provided under applicable Division 26 electrical specification sections. Provide decorative metal housings under this Section.

**1.2 REFERENCES**

- A. General: Comply with the applicable provisions of the referenced standards except as modified by governing codes and the Contract Documents. Where a recommendation or suggestion occurs in the referenced standards, such recommendation or suggestion shall be considered mandatory. In the event of conflict between referenced standards, this specification or within themselves, the more stringent standard or requirement shall govern.
- B. The Aluminum Association (AA): "Designation System for Aluminum Finishes".
- C. American Architectural Manufacturers Association (AAMA)
  - 1. AAMA 2605 "Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels".



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2. AAMA 2603 "Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels".

**D. American Welding Society (AWS)**

1. AWS D1.1 "Structural Welding Code - Steel".
2. AWS D1.2 "Structural Welding Code - Aluminum".
3. AWS D1.3 "Structural Welding Code - Sheet Steel".
4. AWS D1.6 "Structural Welding Code - Stainless Steel".

NTS: Utilize below when railings are required

**E. ASTM International (ASTM)**

1. ASTM E894 "Standard Test Method for Anchorage of Permanent Metal Railing Systems and Rails for Buildings "
2. ASTM E935 "Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings".
3. ASTM E985 "Standard Specification for Permanent Metal Railing Systems and Rails for Buildings".
4. ASTM E1481 "Standard Terminology of Railing Systems and Rails for Buildings".
5. ASTM E2353 "Standard Test Methods for Performance of Glass in Permanent Glass Railing Systems, Guards, and Balustrades".

**F. Copper Development Association (CDA): CDA Publication No. 120/2 "Welding, Soldering, Brazing and Surfacing of Copper and Copper Alloys".**

**G. Industrial Fasteners Institute (IFI): "Fastener Standards Book."**

**H. National Association of Architectural Metal Manufacturers (NAAMM)**

1. NAAMM "Metal Finishes Manual".
2. NAAMM "Pipe Railing Systems Manual."

**1.3 DEFINITIONS**

- A. "Decorative Metal" work is hereby defined to include items, custom or proprietary, fabricated from stainless steel ferrous and non-ferrous metal shapes, plates bars, tubes, extrusions, castings, which are not included as part of an overall system specified in another Section.
- B. Excessive Fading: Change in appearance which is perceptible and objectionable when viewed visually in comparison with original color range standards.



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- C. Excessive Non-Uniformity of Color, Shade or Finish: Non-uniform fading during warranty period to extent that adjacent panels have color difference greater than original acceptable color range.
- D. Cracking, Peeling, Pitting or Corroding: Defect, discernable from the following distances.
  - 1. Interior: 1 ft. 0 in.
- E. Hairline Joint: Maximum 1/64 in. wide.

**1.4 SYSTEM DESCRIPTION**

- A. Performance Requirements
  - 1. Handrails, Railings, and Guardrails
    - a. Structural Performance of Handrails and Railings: Comply with requirements of ASTM E 985 for structural performance based on testing performed according to ASTM E 894 and ASTM E 935.
    - b. Provide handrails and railings capable of withstanding the following structural loads without exceeding allowable design working stress of materials for handrails, railings, anchors, and connections:
      - 1) Design and construct per loads specified by the current version of the California Building Code
  - 2. Expansion and Contraction: Design, fabricate and install exterior decorative metal component parts to provide for expansion and contraction of each assembly or system over an ambient temperature range of 120 deg. F. (49 deg. C.) and a surface temperature range of 180 deg. F. (82 deg. C.) without buckling, joint failure, undue stress on members or anchors, and other detrimental effects on exterior decorative metal assemblies of systems or to contiguous work by others.
  - 3. Design Modifications: Make design modifications of work shown only as may be necessary to meet performance requirements and coordinate the work. Variations in details and materials which do not adversely affect appearance, durability or strength shall be submitted to the Architect for review. Maintain the general design concept without altering profiles and alignments shown.

**1.5 SUBMITTALS**

- A. Product Data: Submit for Architect's action. Submit manufacturer's technical literature, specifications and installation instructions describing the general properties of each material and accessory to be used in the Work.
- B. Shop Drawings: Submit for Architect's action. Provide shop drawings for decorative metal work, including dimensioned plans and elevations drawn at a minimum scale of 1 in. = 1 ft. (1:10) and details of sections, connections and anchorage drawn at a minimum scale of 3 in. = 1 ft. (1:5) Indicate materials and profiles of each decorative metal member, fittings, joinery, finishes, fasteners, and accessory items.



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1. Setting Drawings: Provide setting drawings and templates for the location of decorative metal items that are to be embedded in or anchored to concrete or masonry.
- C. Samples: Submit for Architect's action. Label samples to indicate product, characteristics, and location in the Work. Samples will be reviewed for color and appearance only. Furnish sufficient samples to establish the full range of colors and textures for materials exposed in the finished work. Compliance with other requirements is the responsibility of the Contractor. Provide the following:
  1. Each finish of each metal on the gage and alloy to be used in the final work, 12 in. (305mm) x 12 in. (305mm).
  2. Typical welded corner and butt joints.
  3. Other specified items as requested.
- D. Calculations: Submit for Architect's information. Provide structural calculations for items with specified design loads. Calculations shall bear the seal of a Structural or Civil Engineer registered in the State of California.
- E. Quality Control Submittals: Submit for Architect's information.
  1. Test Reports: Copies of the following laboratory test reports:
    - a. ASTM B137 - Anodic Coating Weight
    - b. ASTM B244 - Anodic Coating Thickness
    - c. ASTM B136 - Stain Test
  2. Certifications
    - a. Document Review: Before commencing work, submit a written statement signed by the Contractor and the Applicator certifying that the Contract Documents, shop drawings and product data have been reviewed with material manufacturers' qualified technical representatives and that they agree the selected materials are proper, compatible with contiguous materials and adequate for the application shown.
    - b. Manufacturer's and fabricator's certification indicating that anodic coating complies with the Contract Documents.
  3. Installer's Qualifications: Evidence of successful completion of work of similar scope to that shown and specified for this Project.
  4. Manufacturer's Qualifications: Evidence that the specified materials have been manufactured by the same source and successfully utilized for a minimum of 5 years on projects of a similar scope to that shown and specified for this Project.
- F. Closeout Submittals: Submit for Owner's documentation.
  1. Warranties: Special warranties as specified.

2. Maintenance Manuals: Describing the materials, and procedures for cleaning and maintaining each metal type. Include manufacturer's data describing the materials and finishes used in the work.

#### **1.6 QUALITY ASSURANCE**

- A. Qualified Installer: The decorative metal work shall be performed by an installer having 5 years experience in the installation of specified materials on comparable projects and shall have the approval of the decorative metal materials fabricator/manufacturer.
- B. Single-Source Responsibility: Obtain decorative metal from one source of a single fabricator/manufacturer. Obtain accessory products used in conjunction with decorative metal from the decorative metal fabricator/manufacturer or from sources acceptable to the decorative metal fabricator/manufacturer.
- C. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from authorities.
- D. Pre-Installation Meetings: Prior to the start of the Work, meet at the Project site to review methods and sequence of decorative metal installation, special details and conditions, standard of workmanship, testing and quality control requirements, job organization and other pertinent topics related to the Work.

#### **1.7 DELIVERY, STORAGE AND HANDLING**

- A. Packing, Shipping, Handling, and Unloading: Deliver decorative metal work fully sealed and identified.
- B. Storage and Protection: Store indoors, above the floor, protected from construction activities and other sources of damage. Protect from damage from any source. Provide removable protection as required.

#### **1.8 WARRANTIES**

- A. General: Warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and are in addition to and run concurrent with other warranties and guaranties made by the Contractor under requirements of the Contract Documents. Submit warranties for Owner's documentation.
- B. Special Warranty, PVDF Coatings: Provide a written warranty, from the manufacturer (formulator) of PVDF coating system and the finisher for a period of (20) twenty years, and addressed to the Owner and assignable to all future Owners within this warranty period warranting against the loss of film integrity, chalking, fading, non-uniformity, corrosion and the overall performance of color of the PVDF coatings. Upon notification of defects, within the warranty period, make the necessary replacements at the convenience of the Owner.
  1. Color retention not to exceed 5ΔE Units (Hunter) color change as calculated in accordance with ASTM D2244 on exposed surfaces cleaned with clean water and a soft cloth.



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2. Degree of chalking not to exceed rating No. 8 for colors and No. 6 for whites when measured in accordance with ASTM D4214 Test Method, Test Method A on exposed unwashed surfaces.
- C. Special Warranty Organic Coated Finish: Provide a written Warranty for a period of (5) five years, and addressed to the Owner and assignable to all future Owners within this warranty period, warranting that the organic coated finish will not fade, stain or discolor excessively or to a non-uniform appearance, and will not corrode, crack, craze, peel, or deteriorate due to weather and atmospheric exposure. Upon notification of defects, within the warranty period, make the necessary replacements at the convenience of the Owner.
- D. Special Warranty, Anodized Coatings: Provide a written Warranty for a period of (5) five warranting that the anodized aluminum will not develop excessive fading or excessive non-uniformity of color or shade, and will not crack, peel, pit, or corrode; within limits defined as follows:
  1. "Excessive fading": means a change in appearance which is perceptible and objectionable as determined by the Architect when viewed visually in comparison with the original color range standards.
  2. "Excessive non-uniformity": means non-uniform fading during the period of the Warranty to the extent that adjacent panels have a color difference greater than the original acceptable color range.
  3. "Will not crack, peel, pit or corrode": means there shall be no cracking, peeling, pitting or other type of corrosion discernible from a distance of 10 ft. (3m), resulting from the natural elements in the atmosphere.
  4. Upon notification of defects, within the warranty period, make the necessary replacements at the convenience of the Owner.
- E. Special Warranty, Porcelain Enamel Finish: Provide a written Warranty for a period of (5) five years, and addressed to the Owner and assignable to all future Owners within this warranty period, warranting that the porcelain enameled finish will not fade, stain or discolor excessively or to a non-uniform appearance, and will not corrode, crack, craze, peel, or deteriorate due to weather and atmospheric exposure. Upon notification of defects, within the Warranty period, make the necessary replacements at the convenience of the Owner.
- F. Special Warranty, Laminated Aluminum Panels: Provide a written warranty for a period of (5) five years, and addressed to the Owner and assignable to all future Owners within this warranty period, warranting that the laminated aluminum panels will not delaminate from core, will not warp or oilcan. Upon notification of defects, within the warranty period, make the necessary replacements at the convenience of the Owner.

**PART 2 - PRODUCTS**

**2.1 METAL MATERIALS**

- A. General:



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1. **Metal Surfaces:** For the fabrication of decorative metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes. Do not use materials which have stains and discolorations including welds which do not match the material, or do not match the Architect's sample in color and grain characteristics.
2. **Surface Flatness and Edges:** For exposed work provide materials which have been cold-rolled, cold-finished, cold-drawn, extruded, stretcher leveled, machine cut and otherwise produced to the highest commercial standard for flatness with edges and corners sharp and true to angle or curvature as required.
3. **Alloys and Tempers:** Wherever alloys or tempers of metals are not shown or specified, or are shown or specified only by series or other general designation, provide the specific alloy which will weld and machine properly, and will finish to match the Architect's sample and other work in the same area, which is shown or specified to have the same finish. Use the temper or hardness which will provide the greatest strength and durability, consistent with necessary forming, fabrication and finishing processes.

**B. MTL-01 Aluminum:**

Provide alloy and temper recommended by aluminum producer or finisher for type of use and finish indicated, and with not less than the strength and durability properties of the alloy and temper designated below for each aluminum form required.

1. **Extruded Bar and Shapes:** ASTM B221, 6063-T6.
2. **Extruded Pipe and Tube:** ASTM B429, 6063-T6.
3. **Drawn Seamless Tube:** ASTM B483, 6063-T832.
4. **Plate and Sheet:** ASTM B209, 6061-T6.
  - a. **Alloy for Anodized Finish:** 5005.
5. **Die and Hand Forgings:** ASTM B247, 6061-T6.
6. **Castings:** ASTM B26, Alloy A356-T6.
7. **Alloy for Colored Anodized Finish:** Controlled alloys and temper as recommended by aluminum manufacturer to provide required color and color matching.

**C. MTL-02 Stainless Steel**

1. **ASTM A240;** Provide the most suitable austenitic alloy, form and finish required to produce the Work. Provide Type 304 for interior and Type 316 for exterior, and low carbon Type 304L or 316L for components to be welded, unless otherwise noted.
  - a. **Plate and Sheet:** ASTM A480, Stretcher level sheets.





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- b. Bar Stock: ASTM A276.
- c. Round, Square, and Rectangular Welded Tubing: ASTM A554, Grades MT 301, MT 302, or MT 304, as standard with manufacturer.
- d. Pipe: ASTM A312, Grade TP 304.
- e. Castings: ASTM A743, Grade CF8 or CF20.

**D. MTL-04 Bronze and Brass:**

- 1. Shapes as shown and as required to fulfill performance requirements. Standard commercial tempers and hardness and suitable for finishing as specified. Provide the following:
- 2. Sheet, Plate, Bars, Rod and Wire: Muntz Metal, CDA Alloy 280. Stretcher level sheets.
- 3. Tube and Pipe: Red Brass, CDA Alloy 230.
- 4. Extruded Shapes: CDA Alloy 385.
- 5. Castings: ASTM B584, Alloy UNS No. C85700.
- 6. Forgings: ASTM B124.

**E. MTL-03 Steel**

- 1. Structural Steel Shapes: ASTM A36.
- 2. Steel Plates: ASTM A283, Grade C.
- 3. Steel Tubing: ASTM A500; Cold-formed, welded or seamless process. For exterior use and other locations noted, provide hot-dip galvanized (minimum spangle) tubing in accordance with ASTM A153.
- 4. Steel Pipe: ASTM A53, Type S, Grade A, suitable for close coiling, black finish unless galvanizing is required; standard weight (Schedule 40), unless otherwise indicated or required to satisfy performance criteria.
- 5. Steel Bars and Bar Size Shapes: ASTM A675, Grade 65, or ASTM A36.

**2.2 FASTENER AND ANCHORAGE MATERIALS**

- A. Fasteners: Stainless steel type 300 Series or bronze CDA Alloy 230, type and size best suited for its intended use. Where exposed in finished surfaces, use oval-head countersunk Phillips heads with head diameter one screw size larger than the shank diameter. Material and finish to match adjacent surfaces. Where fasteners screw-anchor into material less than 1/8 in. thick, reinforce the interior surface with non-magnetic type stainless steel to receive screw threads or provide manufacturer's standard non-corrosive pressed-in splined grommet nuts. Provide fasteners meeting the requirements of IFI standards.



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- B. Anchors and Inserts: Provide anchors and inserts for attachment of decorative items to masonry and concrete. Anchors and inserts shall be non-corrosive and compatible with contiguous metals.
- C. Welding Electrodes: Type and alloy recommended by the producer of the metal to be welded and as required for color match, strength and compatibility in the fabricated items.
- D. Brazing Filler Material: Alloy and type best suited for color match and strength as recommended by the bronze manufacturer.

### 2.3 PAINT AND COATING MATERIALS

- 1. Refer to 09 91 00 "Painting" for finishing requirements where interior or exterior paint is final finish.
- 2. Refer to 09 96 00 "High Performance Coatings" for powder and fluoropolymer coatings where indicated in drawings.

### 2.4 FABRICATION

- A. Field Measurements: Prior to fabrication, verify dimensions and conditions at the job site so that decorative metal work will accurately fit to adjacent work.
- B. Forming: Form work to true shapes, without distortion, with accurate surfaces and edges. Unless otherwise shown, form metal corners by bending to smallest radius possible without impairing the work. Back-cut and brakeform corners. Produce flat, flush surfaces without cracking or grain separation at bends. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain profile of member throughout entire bend without buckling, twisting, or otherwise deforming exposed surfaces of components. Dress edges of cut to provide even appearance.
- C. Assembly: Carefully fit and assemble work with continuity of line and design, using rigidly secured joints with hairline contact, unless otherwise shown. Form butt hairline joints with roll-over edge exposed. Grind off roll-over edge flush with and matching of adjacent metal. Shop assemble work. Disassemble units too large for shipment and provide them with alignment and splice plates for accurate field fit. Build in straps, plates, and brackets as needed to support and anchor fabricated items to adjoining construction. Reinforce formed-metal units as needed to attach and support other construction.
- D. Welding: Weld with electrodes and by methods recommended by the base metal manufacturer, and in accordance with applicable recommendations of the AWS, to avoid distortion or discoloration of exposed faces. Make welds continuous unless otherwise shown. Grind exposed welds flush, to match adjacent metal. Bevel cut base metal before welding to maintain continuity of line at joints. No visible seams are permitted.
- E. Brazing: Braze with filler material and by methods recommended by the base material manufacturer and in accordance with the applicable recommendations of CDA 120/2. Use blind or concealed joints and minimize distortion by proper fit-up and the use of suitable jigs and fixtures. Grind off exposed joints flush with and matching finish of adjacent metal.
- F. Reinforcing: Reinforce members and joints with structural shapes and plates in

concealed locations, as necessary for adequate strength and rigidity.

- G. Fastenings: Provide concealed fastenings unless otherwise shown. Locate necessary exposed fastenings in an orderly pattern, in accordance with reviewed shop drawings.
- H. Galvanizing: ASTM A123 for galvanizing rolled, pressed and forged steel shapes, plates, bars, strip 1/8 in. (3mm) thick and heavier and for assembled products.
- I. Dissimilar Metals: Separate dissimilar metals with dielectric separator to prevent galvanic action. Do not extend coatings onto exposed surfaces.
- J. Protection of Finishes Prior to Shipment: Prior to shipment protect finishes on exposed surfaces from damage by application of strippable temporary protective covering or other means.

## **2.5 GUARDRAILS, HANDRAILS AND RAILINGS**

- A. Silicone Bronze Railing: Provide in areas as shown as described in drawings, silicone bronze hand rails complete with concealed framing, mounting, supports and attachment devices shown or required for a secure installation. Railings shall have tight fitting sleeved connection to post with concealed countersunk set screw as shown in drawings.

## **2.6 MISCELLANEOUS DECORATIVE METALWORK**

- A. Miscellaneous Items: Provide other items of decorative metal, exposed to view in the finished work, that is not included in other work.

## **2.7 FINISHES**

- A. General: As shown for the respective units and matching the reviewed samples. Remove scratches, abrasions, dents, die markings and other defects prior to finishing operations. Perform this work in addition to finish treatment specified. Comply with NAAMM "Metal Finishes Manual" for finish designations and application recommendations unless otherwise specified.
- B. Aluminum Finishes
  - 1. Fluoropolymer PVDF coating System: As specified in 09 96 00 "High Performance Coatings"
  - 2. Organic Coating: Electrolytically applied baked-on acrylic or polyester enamel coating in colors and gloss as selected by the Architect, of minimum 0.80 mils (0.020mm) dry film thickness complying with AAMA 2603 and AA-C12C42R1x applied over manufacturer's standard substrate preparation including a acid chromate fluoride phosphate conversion coating.
  - 3. Anodized Aluminum Finishes: Remove die markings prior to finishing operations. Where necessary to remove die markings from any part of the work, members must be finished by the same process, whether or not die markings exist.



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Perform this work in addition to the finish specified. Scratches, abrasions, dents and similar defects are unacceptable.

**C. Stainless Steel Finishes**

1. Metal Type MTL-2A: No. 4 (Long Grain Brushed Finish).

**D. Bronze and Brass Finishes**

1. Metal Type MTL-04 NAAMM M32-C55, medium statuary.
2. Clear Organic Coating: Clear air-drying acrylic lacquer specially developed for coating copper alloy products, applied by air-spray in 2 coats per manufacturer's directions, with interim drying, to a total thickness of 1.0 mil (0.0254mm). Provide "Incralac" (as developed by International Copper Research Corporation).

**E. Lacquer Finish: Prepare substrate in accordance with paint manufacturer's directions. Provide 1 coat "No. 1410 Sanding Undercoat" (FYN Paint & Lacquer Co.) or approved equal. Sand with 000 steared paper sandpaper. Provide additional 1 coat "No. 1410 Sanding Undercoat". Sand with 000 steared paper sandpaper. Provide 2 coats gloss lacquer, color as selected. Rub with water and pumice. Provide additional 2 coats water white clear lacquer.**

**F. Ferrous Metal Finish**

1. General: Shop paint steel shapes and plates, except members or portions of members to be embedded in concrete, and edges to be field welded.
2. Removal Of Oil, Grease And Similar Contaminants: Remove oil, grease and similar contaminants in accordance with SSPC SP-1 "Solvent Cleaning", prior to any additional surface preparation specified.
3. Metal Surfaces: Clean and prepare metal surfaces before applying shop coat. Remove rust and mill scale in accordance with SSPC SP-6 "Commercial Blast Cleaning".
4. Application of Primer: Immediately after surface preparation, apply primer in accordance with manufacturer's instructions. Use painting methods which will result in full coverage and dry film thickness specified.

**PART 3 - EXECUTION**

**3.1 GENERAL**

- A. Manufacturer's Instructions:** Prepare substrates and install the work of this Section, including equipment, components, and accessories in accordance with the manufacturer's instructions, except where more stringent requirements are shown or specified, and where project conditions require extra precautions or provisions to ensure satisfactory performance of the Work.



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**3.2 EXAMINATION**

- A. Verification of Conditions: Examine the areas to receive the Work and the conditions under which the Work would be performed. Contractor shall remedy conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.
- B. Dimensions: Verify dimensions of supporting structure by field measurements so that decorative metal work will be accurately designed, fabricated and fitted to the structure. Tolerances for supporting structure are specified in other Sections.

**3.3 PREPARATION**

- A. Substrate Acceptability: Commencement of installation shall constitute acceptance of substrate conditions by the Installer.
- B. Coordination: Coordinate decorative metal work with the adjacent work of other sections. Provide items to be placed during the installation of other work at the proper time to avoid delays. Coordinate placement of items, including inserts and anchors, accurately in relation to the final location of decorative metal work.

**3.4 INSTALLATION, GENERAL**

- A. Design Temperature: Dimensions shown on Drawings are based on an assumed design temperature of 70 deg. F. (21 deg. C.) Fabrication and erection procedures shall take into account the ambient temperature range at the time of the respective operations.
- B. Procedures: Perform cutting, drilling and fitting required. Install work in locations shown, plumb, level and in line with adjacent materials where required. Provide fastenings as shown on shop drawings, and as necessary for a rigid, secure and permanent installation. Make provisions for removable items.
  - 1. Fasten to metal with bolts or machine screws threaded full length of the shank, with lock nuts on bolts.
  - 2. Fasten to inserts in concrete or solid masonry, or use expansion bolts. Fasten to hollow masonry units with toggle bolts. Drill holes for bolts no larger than shank diameter.
- C. Fitting: Field cutting or trimming not allowed. Return units to shop for required alterations, followed by complete refinishing. Do not install members which are observed to be warped, bowed, deformed or otherwise damaged or defaced to such extent as to impair strength or appearance. Remove and replace members which have been damaged.
- D. Corrosion Protection: Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of specified dielectric separator.
- E. Concealed Fasteners: Provide concealed fasteners at all locations. Size fasteners to support work, with fasteners spaced to prevent buckling or waviness in finished surfaces. Drill and tap holes required for securing work to other surfaces.
- F. Joints: Support joints with concealed stiffeners as required to hold exposed faces of



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adjoining units in flush alignment. Miter or cope trim members at corners to form tight joint.

**3.5 INSTALLATION, SPECIFIC ITEMS**

**A. Guardrails, Handrails, and Railings**

1. Adjustment of Systems and Spacing of Posts: Adjust handrails and railing systems prior to anchoring to ensure matching alignment at abutting joints. Space posts at interval indicated but not less than that required by design loadings.
2. Anchorage: Anchor posts to metal surfaces with fittings designed for this purpose. Anchor railing ends to metal surfaces with fittings using concealed fasteners.
3. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws using plastic filler cement colored to match finish of handrails and railing systems.
4. Welded Connections: Use fully welded joints for permanently connecting railing components by welding. Cope or butt components to provide 100% contact or use fittings designed for this purpose.
5. Expansion Joints: Provide expansion joints at locations indicated or, if not indicated, at intervals not to exceed 40 ft. (12m). Provide slip-joint internal sleeve extending 2 in. (50mm) beyond joint on either side; fasten internal sleeve securely to one side, locate joint within 6 in. (150mm) of post.

- B. Closures And Trim:** Form closures and trim members from stainless steel sheet metal of type and minimum nominal thickness as indicated. Incorporate components required for support and installation of closures and trim. Fabricate closures and trim to tightly close with adjoining construction.

**3.6 ADJUSTING**

- A. Touch-Up Painting:** Field paint marred or abraded shop paint and welds after cleaning these areas. Separate dissimilar metals and metals in contact with concrete or masonry with dielectric separator or gaskets. Do not extend coatings onto exposed surfaces.
- B. Touch-Up to PVDF Coated Paint System:** Touch up damaged, scratched, marred or abraded exposed fluoropolymer resinous coated paint utilizing manufacturer/fabricator approved air dried fluoropolymer resinous paint system in matching colors and sheen using means and methods as recommended by the manufacturer. Obtain Architect's approval of finished touch-up.
- C. Touch-Up to Baked Organic Coated Paint System:** Touch up damaged, scratched, marred or abraded exposed baked organic coatings utilizing manufacturer/fabricator approved paint system in matching colors and sheen using means and methods as recommended by the manufacturer. Obtain Architect's approval of finished touch-up.



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**3.7 PROTECTION**

- A. Protection: Upon completion of installation clean exposed metal surfaces as recommended by manufacturer and install protection. Protect finished surfaces against damage during subsequent construction operations and remove protection at time of substantial completion.

**END OF SECTION**

**SECTION 06 10 00  
ROUGH CARPENTRY**

**PART 1 – GENERAL**

**1.1 SUMMARY**

- A. This Section includes the following:
  - 1. Framing with dimension lumber.
  - 2. Rooftop equipment bases and support curbs.
  - 3. Wood blocking, cants and nailers.
  - 4. Sheathing.
  - 5. Subflooring and underlayment.
  - 6. Plywood backing panels.
  - 7. Communications and electrical room mounting boards ("backboards").
  - 8. Related framing anchors and connectors

**1.2 RELATED WORK SPECIFIED ELSEWHERE:**

- A. Section 05 12 00 – Structural Steel.

**1.3 REFERENCES**

- A. ANSI/AWC NDS 2018 – National Design Specification for wood Construction
- B. WFCM 2018 – Wood Frame Construction Manual
- C. SDPWS 2015 - Special Design Provisions for Wind and Seismic
- D. ALSC (American Lumber Standards Committee) - Softwood Lumber Standards.
- E. APA (American Plywood Association) - Guide to Plywood Grades.
- F. ASTM A307 - Carbon Steel Externally Threaded Standard Fasteners.
- G. ASTM D3498 - Adhesives for Field-Gluing Plywood to Lumber Framing for Floor Systems.
- H. AWPB (American Wood Preservers Association) - Book of Standards.
- I. AWPB (American Wood Preservers Bureau) - Book of Standards.





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- J. DFPA (Douglas Fir Plywood Association)
- K. FS FF-S-325 - Shield, Expansion; Nail, Expansion; and nail, Drive Screw (Devices, Anchoring, Masonry).
- L. FS TT-W-571 - Wood Preservation - Treating Practices.
- M. NLMA (National Lumber Manufacturers Association) - National Design Specification for Stress-Grade Lumber and Its Fastenings.
- N. WCLIB (West Coast Lumber Inspection bureau) – Grading Rules for West Coast Lumber
- O. WWPA (Western Wood Products Association) - Western Lumber Grading Rules

#### 1.4 SUBMITTALS

- A. See Div 01 - Submittal Requirements for submittal procedures.
- B. Product Data:
  - 1. For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
  - 2. Custom and heavy metal framing connectors.
  - 3. Include date 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.

#### 1.5 QUALITY ASSURANCE

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Inspection Agencies: Inspection agencies and the abbreviations used to reference them with lumber grades and species include the following:
  - 1. WCLIB - West Coast Lumber Inspection Bureau.
  - 2. WWPA - Western Wood Products Association.
- C. Industry Standards:
  - 1. Lumber Grading Agency: Certified by WCLIB or WWPA as pertinent to product.
    - a. Do not apply inspection service grade mark on timber shown as exposed in the work and with transparent finish.
    - b. Submit certificate of grade compliance, obtained from grading agency with each shipment.



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2. Plywood Grading Agency: Certified by APA.
- D. Regulatory Requirements: Conform to Chapter 23 of International Building Code for member and fastener sizes and type of fasteners, unless otherwise indicated on Drawings.
- E. Single-Source Responsibility for Engineered Wood Products: Obtain each type of engineered wood products from one source from a single manufacturer.
- F. All wood used on the project shall be Forest Stewardship Council (FSC) Certified, with no added urea or formaldehyde.

**1.6 DELIVERY, STORAGE AND HANDLING**

- A. Lumber Delivery and Storage: Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces.
  1. Stack lumber as well as plywood and other panels.
  2. Provide for air circulation within and around stacks and under temporary coverings including polyethylene and similar materials.

**1.7 DEFINITIONS**

- A. Rough Carpentry: Carpentry work not specified in other Sections and not exposed, unless otherwise indicated.
- B. Exposed Framing: Dimension lumber not concealed by other construction.
- C. Lumber grading agencies, and the abbreviations used to reference them, include the following:
  1. NELMA - Northeastern Lumber Manufacturers Association.
  2. RIS - Redwood Inspection Service.
  3. APA – American Plywood Association.
  4. WCLIB - West Coast Lumber Inspection Bureau.
  5. WWPA - Western Wood Products Association.
- D. All lumber to be specified as FSC certified to the greatest extent possible.



**PART 2 - PRODUCTS**

**2.1 WOOD PRODUCTS, GENERAL**

- A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.
- B. All lumber to be specified as FSC certified to the greatest extent possible.
  - 1. Factory mark each piece of lumber with grade stamp of grading agency.
  - 2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
  - 3. 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.
  - 4. Provide dressed lumber, S4S, unless otherwise indicated on Drawings.
  - 5. Concealed Lumber: provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal thickness or less, unless otherwise indicated on Drawings.
  - 6. Exposed Lumber: Dense Select Structural.
  - 7. Sill or Sole Plates: As indicated on Drawings
  - 8. Top Plates: As indicated on Drawings
  - 9. Studs: As indicated on Drawings
  - 10. Posts: As indicated on Drawings.
  - 11. Joists: As indicated on Drawings.
  - 12. Non-load Bearing and Furring: As indicated on Drawings
  - 13. Rafters: As indicated on Drawings
  - 14. Miscellaneous Framing: For site structures and other exposed conditions, provide No. 2 grade Douglas Fir-Larch, unless otherwise indicated on Drawings, selected for appearance. At site structures, provide light sandblast finish on exposed wood framing.
  - 15. Wane: Limit wane to 5 percent of members in accordance with WWPA standards. Do not locate members with wane at plywood sheathing joints, at solid blocking or at double plates.

## **2.2 WOOD STRUCTURAL PANELS**

- A. Plywood Materials, General: APA Performance-Rated Panels, Group 1 Series, PS 1-95, species and thickness as indicated on Drawings and as specified herein.
- B. Plywood Panels for Roof Sheathing: Douglas fir, Structural I, APA RATED SHEATHING.
  - 1. Exposure Durability Classification: EXTERIOR.
  - 2. Thickness: As indicated on the Drawings.
  - 3. Edge detail, low slope roofs: Square if all edges supported on framing or tongue-and-groove (T&G) if edges are unsupported. Plyclips will not be acceptable.
  - 4. Span Rating = Not less than 24"
- C. Plywood for Floor Sheathing: Douglas fir, Structural-I-Floor, APA RATED SHEATHING.
  - 1. Exposure Durability Classification: EXTERIOR
  - 2. Thickness: As indicated on the Drawings
  - 3. Edge detail: Provide either tongue and groove (T&G) plywood edges or square edges with full support of edges on framing and blocking. Plyclips will not be acceptable.
  - 4. Span Rating = Not less than 24"
- D. Plywood Panels for Wall Sheathing: Douglas fir, Structural I, APA RATED SHEATHING.
  - 1. Exposure Durability Classification: EXTERIOR
  - 2. Thickness: As indicated on the Drawings
  - 3. Edge detail: Square
  - 4. Span Rating = Not less than 24"
- E. Other Applications:
  - 1. Plywood Concealed From View But Located Within Exterior Enclosure: PS 1, C-C Plugged or better, Exterior grade.
  - 2. Plywood Exposed to View But Not Exposed to Weather: PS 1, A-D, or better.
  - 3. Other Locations: PS 1, C-D Plugged or better.

## **2.3 PRESERVATIVE TREATED WOOD PRODUCTS**

- A. Wood Treatments, General: Where used for exposed locations, treatment materials shall be types guaranteed to not adversely affect durability and appearance of applied finishes.

1. Treatment materials having a highly persistent, noticeable residual odor will not be permitted.
  2. After treatment, kiln or air dry lumber and plywood to a moisture content of 19 percent or less or as indicated on the drawings.
- B. Preservative Treatment, Members Intended for Finishing: Water-borne salt preservatives for painted, stained, or exposed natural wood product, AWPB LP-2, above ground application and AWPB LP-22, ground contact application.
- C. Preservative Treatment, Members Not Intended for Finishing: Oil-borne preservatives for any construction except when in contact with salt water, AWPB LP-33, ground contact application, light petroleum solvent.

## **2.4 CONNECTORS**

### **A. Framing Connectors:**

1. Specified Manufacturer: Simpson Strong-Tie Co., Pleasanton, CA (510/460-9912 or 800/999-5099; local representatives, Brea, CA (714/871-8373 or 800/999-5099).
2. Acceptable Manufacturers: None identified. Equivalent products of other manufacturers will be considered in accordance with the substitution provision specified in Division 1. Substitutions shall be used only with prior approval of Architect, based on review by Structural Engineer.
3. Light framing connectors: Simpson Strong-Tie Connectors, formed of sheet steel, catalog number as indicated on the Drawings and to suit Project conditions.
4. Heavy framing connectors: Simpson Strong-Tie Connectors, formed of steel plate or heavy gage steel sheet, catalog number as indicated on the Drawings and to suit Project conditions. Provide custom or special-order framing connectors as necessary to suit Project conditions and as indicated on the Drawings.
  - a. Stock framing connectors: Simpson - Strong Tie Connectors, catalog number as indicated on the Drawings and to suit Project conditions.
  - b. Custom framing connectors: Fabricated as indicated on Drawings and as specified in Section 05 1200 – Structural Steel.

### **B. Finishes:**

1. Light framing connectors: Provide manufacturer's standard galvanized finish. Heavy framing connectors, exterior: Hot-dipped galvanized, equivalent to ASTM A525, Coating Designation G90.
2. Heavy framing connectors, interior: Plain steel with shop primer paint finish, as specified in Section 05 1200 – Structural Steel.

3. Custom framing connectors: Fabricated as specified in Section 05 1200 – Structural Steel At interior and concealed locations, provide plain steel with shop primer paint finish. At exterior locations, provide hot-dipped galvanized finish.

## **2.5 FASTENERS AND ANCHORS**

- A. Fasteners, General: Size and type as indicated on Drawings. Provide electro-galvanized finish at interior high humidity locations and exterior locations not directly exposed to weather. Provide hot-dipped galvanized at exterior locations directly exposed to weather. Plain finish may be provided elsewhere.
- B. Anchor Bolts: ASTM A36/A307 or as indicated on Drawings, galvanized steel at exterior locations.
  1. Do not upset threads on bolts.
  2. Anchor bolts for hold-downs shall be headed.
- C. Machine Bolts: ASTM A307, hex head and nut, full bearing on unthreaded shank, length for maximum 1-1/2 inch beyond nut, with steel washer under head and nut. Provide hot-dipped galvanized finish at exterior locations.
- D. Lag Bolts and Screws: Fed Spec FF-S-588, size as indicated on Drawings.
- E. Nails, Typical: Common wire, sizes as indicated on Drawings and as required by CBC-2022 Chapter 23 and applicable reference standard.
  1. No box nails shall be used.
  2. Machine applied nailing will be subject to approval as specified on the Drawings and as approved by code authority having jurisdiction.
- F. Screws: Fed Spec FF-S-85, Fed Spec FF-S-92 and Fed Spec FF-S-111, type and grade best suited for the purpose, size as indicated on Drawings.
- G. Construction Adhesive: APA Spec. AFG-01.
- H. Grout for Sill Plates: Type S mortar cement grout.

## **2.6 WOOD PRESERVATIVE TREATMENTS**

- A. Wood Preservative Treatments, General: Where lumber or plywood is indicated as preservative-treated or is specified to be treated, comply with applicable requirements of AWPA C2 (Lumber) and AWPA C9 (Plywood).
  1. Mark each treated item with the Quality Mark Requirements of an inspection agency approved by American Lumber Standards Committee (ALSC) Board of Review.
- B. Wood Members Located Above Ground: Pressure-treat above ground items with water-borne preservatives to a minimum retention of 0.25 pcf. After treatment, kiln dry lumber



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and plywood to a maximum moisture content of, respectively, 19 percent and 15 percent or as indicated on the drawings. Treat indicated items and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping and similar members related to roofing, flashing, vapor barriers and waterproofing.
  2. Wood sills, sleepers, blocking, furring, stripping and similar concealed members in contact with masonry or concrete.
  3. Wood floor plates installed over concrete slabs directly in contact with ground.
- C. Wood Members Located in Contact with Ground: Pressure-treat wood members in contact with ground or fresh water with water-borne preservatives to a minimum retention of 0.40 pcf.
- D. Coordination with Fabrication: Complete fabrication of treated items prior to treatment, where possible. If cut after treatment, coat cut surfaces in compliance with AWWA M4. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.

### 2.7 PLYWOOD BACKING PANELS

- A. Communications and Electrical Room Mounting Boards: PS 1 Grade C-D plywood ; 1" inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

### 2.8 MISCELLANEOUS MATERIALS

- A. Building Paper: Asphalt-saturated organic felt complying with ASTM D 226, Type I (No. 15 asphalt felt), unperforated.
- B. Building Wrap: Air-retarder sheeting made from polyolefins; cross-laminated films, woven strands, or spun-bonded fibers; coated or uncoated; with or without perforations; and complying with ASTM E 1677, Type I.
1. Thickness: Not less than 3 mils.
  2. Permeance: Not less than 10 perms.
  3. Flame-Spread Index: 25 or less per ASTM E 84.
  4. Allowable Exposure Time: Not less than three months.
- C. Building Wrap Tape: Pressure-sensitive plastic tape recommended by building wrap manufacturer for sealing joints and penetrations in building wrap.
- D. Sheathing Tape: Pressure-sensitive plastic tape for sealing joints and penetrations in sheathing and recommended by sheathing manufacturer for use with type of sheathing required.



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- E. Sill-Sealer Gaskets: Glass-fiber-resilient insulation, fabricated in strip form, for use as a sill sealer; 1-inch nominal thickness, compressible to 1/32 inch; selected from manufacturer's standard widths to suit width of sill members indicated.
- F. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to suit width of sill members indicated.
- G. Adhesives for Field Gluing Panels to Framing: Formulation complying with APA AFG-01 that is approved for use with type of construction panel indicated by both adhesive and panel manufacturers.
- H. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chlorpyrifos as its active ingredient.

### PART 3 - EXECUTIONS

#### 3.1 INSTALLATION, GENERAL

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough 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. Do not use materials with defects that impair quality of rough carpentry or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- C. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
  - 1. Published requirements of metal framing anchor manufacturer.
- 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 between members. Install fasteners without splitting wood; pre-drill as required.
- E. Use finishing nails for exposed work, unless otherwise indicated. Countersink nail heads and fill holes with wood filler.

#### 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. Build anchor bolts into masonry during installation





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of masonry work. Where possible, secure anchor bolts to formwork before concrete placement.

### 3.3 WOOD FRAMING INSTALLATION, GENERAL

- A. Framing Standard: Comply with AFPA's "Manual for Wood Frame Construction," unless otherwise indicated.
- B. Place horizontal members laid flat, crown side up.
- C. Erect wood framing members level and plumb.
- D. Do not splice structural members between supports.
- E. Do not notch, bore, or cut members for pipes, vents, conduits or other reasons except as shown on the Drawings or specifically authorized by the Architect.
- F. Construct double joists under discontinuous walls.
- G. Coordinate delivery of glue laminated structural units and plywood web joists
- H. Layout embedded items for entire project.
- I. Shim, strip and furr as necessary to achieve described tolerances

### 3.4 WALL AND PARTITION FRAMING INSTALLATION

- A. General: Arrange studs so wide face of stud is perpendicular to direction of wall or partition and narrow face is parallel. Provide single bottom plate and double top plates using members of 2-inch nominal thickness whose widths equal that of studs. Anchor or nail plates to supporting construction, unless otherwise indicated.
  - 1. Provide nominal 3-inch bottom plates where indicated on drawings.
  - 2. Provide single bottom plate and double top plates, nominal 2-inches thick by width of studs.
  - 3. Overlap double plates minimum of 4 feet or as indicated on Drawings and at corners and intersections. Face nail upper plate to lower top plate as indicated on Drawings.
- B. Construct corners and intersections with three or more studs. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
  - 1. Provide continuous horizontal blocking at mid-height of partitions more than 96 inches high, using members of 2-inch nominal thickness and of same width as wall or partitions.
- C. Fire block concealed spaces of wood-framed walls and partitions at each floor level and at ceiling line of top story. Where fire blocking is not inherent in framing system used, provide

closely fitted wood blocks of 2-inch nominal- thick lumber of same width as framing members.

- D. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Set headers on edge and support on jamb studs. See structural Drawings for specific details.
- E. Provide bracing in walls, at locations indicated, full-story height, unless otherwise indicated. Provide one of the following:
  - 1. Diagonal bracing at 45-degree angle using let-in 1-by-4-inch nominal size boards.
  - 2. Diagonal bracing at 45-degree angle using metal bracing.
  - 3. Plywood panels not less than 48 by 96 inches applied vertically.
  - 4. Particleboard sheathing panels not less than 48 by 96 inches applied vertically.
- F. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.
  - 1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
  - 2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
  - 3. Install adjacent boards without gaps.
  - 4. Size and Location: As indicated on drawings.
  - 5. Install with the best face facing the exposed side.

### **3.5 CEILING JOIST AND RAFTER FRAMING INSTALLATION**

- A. Ceiling Joists: Install ceiling joists 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.



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1. At valleys, provide double-valley rafters of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against valley rafters.
  2. At hips, provide hip rafter of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against hip rafter.
- C. Provide collar beams (ties) as indicated or, if not indicated, provide 1-by-6-inch nominal size boards between every third pair of rafters, but not more than 48 inches o.c. Locate below ridge member, at third point of rafter span. Cut ends to fit roof slope and nail to rafters.
- D. Provide special framing as indicated for eaves, overhangs, dormers, and similar conditions, if any.

### 3.6 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations contained in APA Form No. E30K, "APA Design/Construction Guide: Residential & Commercial," for types of structural-use panels and applications indicated.
1. Comply with "Code Plus" provisions in above-referenced guide.
- B. Fastening Methods: Fasten panels as indicated below:
1. Combination Subfloor-Underlayment:
    - a. Glue and nail to wood framing.
    - b. Space panels 1/8 inch apart at edges and ends.
    - c. Subflooring:
      - 1) Glue and nail to wood framing.
      - 2) Space panels 1/8 inch apart at edges and ends.
    - d. Sheathing:
      - 1) Nail to wood framing.
      - 2) Space panels 1/8 inch apart at edges and ends.
    - e. Underlayment:
      - 1) Nail to subflooring.
      - 2) Space panels 1/32 inch apart at edges and ends.



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- 3) Fill and sand edge joints of underlayment receiving resilient flooring just before installing flooring.
- f. Plywood Backing Panels: Nail or screw to supports.

**3.7 SHEATHING TAPE APPLICATION**

- A. Apply sheathing tape to joints between sheathing panels and at items penetrating sheathing. Apply at upstanding flashing to overlap both flashing and sheathing.

**3.8 TOLERANCES**

- A. Framing Members: 1/4 inch maximum from true position.
- B. Surface Flatness of Floor: 1/4 inch in 10 feet maximum.
- C. Variation from Plane (Other than Floors): 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

**3.9 CLEANING**

- A. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.
- B. Prevent sawdust and wood shavings from entering the storm drainage system.

**END OF SECTION**

**SECTION 06 40 00  
ARCHITECTURAL WOODWORK**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. General: Provide architectural woodwork in accordance with requirements of the Contract Documents.
- B. Related Work Specified Elsewhere
  - 1. Section 01 81 13 "Sustainable Design Requirements" for additional references, definitions, documentation requirements, action plans, meetings, and performance requirements of products and systems.
  - 2. Wood furring, blocking, shims, and hanging strips required for installation of architectural woodwork and concealed within other construction before woodwork installation is specified under Section 06 10 00 "Rough Carpentry".
  - 3. Sealants are specified under Section 07 92 00 "Joint Sealants".
  - 4. Wood doors not in paneled wall are specified under Section 08 14 00 "Wood Doors".
  - 5. Electric and telecommunications wiring, connection to electric power source and building telecommunications lines, provision of outlets is specified under various sections in Division 26.

**1.2 REFERENCES**

- A. General: Comply with the applicable provisions and recommendations of references, except as modified by governing codes and by the Contract Documents. Where a recommendation or suggestion occurs in the references, such recommendation or suggestion shall be considered mandatory. In the event of conflict between references, this specification or within themselves, the more stringent standard or requirement shall govern.
- B. American Wood Protection Association (AWPA)
  - 1. AWPA U1 "Use Category System: User Specification for Treated Wood".
  - 2. AWPA M4 "Care of Preservative-Treated Wood Products".
  - 3. AWPA P49, "Standard for Fire Retardant FR-1".
  - 4. AWPA P50, "Standard for Fire Retardant FR-2".
- C. Architectural Woodwork Institute (AWI) / Woodwork Institute (WI) / Architectural Woodwork Manufacturers Association of Canada (AWMAC): "Architectural Woodwork Standards" (AWS).
- D. The Engineered Wood Association (APA): "Engineered Wood Construction Guide".

- E. National Electrical Manufacturer's Association (NEMA): NEMA LD3, "High Pressure Decorative Laminates"
- F. National Institute of Standards and Technology, U.S. Dept. of Commerce (NIST)
  - 1. Voluntary Product Standard PS-20, "American Softwood Lumber Standards".
  - 2. Voluntary Product Standard PS-1, "Construction and Industrial Plywood".
- G. National Lumber Grades Authority (NLGA): "Standard Grading Rules for Canadian Lumber".
- H. Northeastern Lumber Manufacturers Association (NLMA): "Standard Grading Rules for Northeastern Lumber".
- I. Southern Pine Inspection Bureau (SPIB): "Standard Grading Rules for Southern Pine Lumber".
- J. West Coast Lumber Inspection Bureau (WCLIB): "WCLIB Standard Grading No. 17".
- K. Western Wood Products Association (WWPA): "Western Lumber Grading Rules."

### **1.3 DEFINITIONS**

- A. Architectural Woodwork: Architectural woodwork includes finished architectural woodwork, wood furring, blocking, shims, metal supports, and hanging strips for installing woodwork items, unless concealed within other construction before architectural woodwork installation.
- B. Wood Paneling: Wood paneling includes finished panels, wood furring, blocking, and shims for installing paneling, unless concealed within other construction before paneling installation.
- C. Dimension Lumber: Lumber of 2 in. (50mm) nominal 1-1/2 in. (38 mm) actual or greater but less than 5 in. (125mm) nominal 4-1/2 in. (114mm) actual in least dimension.
- D. Timber: Lumber of 5 in. (125mm) nominal 4-1/2 in. (114mm) actual or greater in least dimension.

### **1.4 SYSTEM DESCRIPTION**

- A. Performance Requirements
  - 1. Standards: In addition to requirements shown and specified, comply with applicable provisions for grading and workmanship of AWS "Architectural Woodwork Standards".
  - 2. Fire Performance Characteristics of Wood Materials: Provide materials identical to those tested for the following fire performance characteristics per ASTM test methods indicated by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction. Identify treated lumber with classification marking of inspecting and testing organization in the form of

separable paper label or, where required by authorities having jurisdiction, of imprint on lumber surfaces that will be concealed from view after installation.

- a. Surface Burning Characteristics: Not exceeding values indicated below, tested per ASTM E84 for 30 minutes with no evidence of significant combustion.
  - 1) Flame Spread: 25.
  - 2) Smoke Developed: 50.
3. Fire Performance Characteristics of Wood Assemblies: Provide materials and composite wood panel assemblies that have been tested and comply with the following fire test performance criteria as determined by an independent testing laboratory acceptable to the authorities having jurisdiction. Tests shall include veneer (including specified finishes), core materials and panel balancing materials that are identical in construction to units tested for the following surface burning characteristics per ASTM E84 by UL or other testing and inspecting organization acceptable to authorities having jurisdiction. Identify panels with appropriate markings of applicable testing and inspecting organization on surfaces that will be concealed from view after installation.
  - a. Composite wood panel assembly when tested in accordance with ASTM E84, 'Unadhered Method', (fully exposed to burn chamber of testing equipment) shall comply with the following:
    - 1) Flame Spread: 25 or less.
    - 2) Smoke Developed: 450 or less.

## **1.5 SUBMITTALS**

- A. Product Data: Submit, for Architect's action, manufacturer's product data for each type of product and process specified in this section and incorporated into items of architectural woodwork during fabrication, finishing, and installation. In addition, submit the following:
  1. Submit catalog cuts of hardware specified herein.
- B. Shop Drawings: Submit for Architect's action. Provide shop drawings of architectural woodwork for the fabrication and the installation of the Work. Include the following:
  1. Large scale details drawn at a minimum scale of 3 in. = 1 ft. (1:5), dimensioned plans, locations and elevations, attachment devices, and adjacent work of other trades drawn at a minimum scale of 1/2 in. = 1 ft. (1:25). Locate and specify each piece of cabinet hardware and related accessories.
  2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcing specified elsewhere.
  3. Show type and locations of architectural woodwork hardware complete with templates required for installation.
  4. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets,



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ARCHITECTURAL WOODWORK**

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soap dispensers, and other items installed in architectural woodwork.

5. Show veneer leaves with dimensions, grain direction, exposed face, and an identification number indicated for each leaf. Identification number shall indicate the flitch and the sequence within the flitch for each leaf.

**NTS:** Edit list below to suit project.

- C. Samples: Submit for Architect's action. Label samples to indicate product, characteristics, and location in the Work. Samples will be reviewed for color and appearance only. Furnish sufficient samples to establish the full range of colors and textures for materials exposed in the finished work. Compliance with other requirements is the responsibility of the Contractor. Submit samples of each of the following items:
  1. Plastic laminate, 12 in. (300mm) square, for each color, pattern and surface finish. Include sample on specified backer with balancing sheet.
  2. Quartz Surfacing: 12 in. (300mm) square, for each color, pattern and surface finish.
  3. Transparent finish for each species of wood veneer laminated to MDF or particleboard, 12 in. (300mm) x 12 in. (300mm), for each finish specified or shown consisting of veneer pieces cut from selected flitch samples, laminated to panel product, for each species and cut. Include at least one face-veneer seam and finish one-half of face as specified.
  4. Opaque finish for wood veneer laminated to MDF or particleboard, 12 in. (300mm) x 12 in. (300mm), for each color, gloss and finish specified or shown.
  5. Each finish type of panel, 24 in. (600mm) wide x 36 in. (900mm) high.
  6. Cabinet hardware exposed in the finished work and other type hardware as requested.
  7. Wood Base: Each type of finish for wood bases; 12 in. long by full height and thickness; completely finished or primed and painted.
- D. Quality Control Submittals: Submit for Architect's information.
  1. Test Reports
    - a. Performance Test Reports for Composite Wood Panels: Submit the following test reports showing compliance with required performance and testing criteria, from an independent testing laboratory:
      - 1) Flame spread and smoke developed ratings for each type of composite wood panel when tested in accordance with ASTM E84, 'Unadhered Method', (fully exposed to burn chamber of testing equipment).
  2. Certifications
    - b. Document Review: Before commencing work, submit a written



statement signed by the Contractor and the Installer certifying that the Contract Documents, shop drawings and product data have been reviewed with appropriate material manufacturers' qualified technical representatives and that they agree the selected materials are proper, compatible with contiguous materials and adequate for the application shown.

- c. Certification of Fire Retardant Treatment of Wood: Submit certification, stating name of fire retardant materials used, and compliance with AWPAC U1. Certify that fire retardant materials will not bleed through painted or natural finish surfaces.
  - d. Certification of Fire Retardant Treatment of Fire Retardant Particleboard: Submit certification that particleboard specified as fire retardant complies with Underwriters' Laboratory Class 1 rating and these Specifications.
  - e. Certification of Fire Retardant Treatment of Fire Retardant Medium Density Fiberboard: Submit certification that medium density fiberboard specified as fire retardant complies with Underwriters' Laboratory Class 1 rating and these Specifications.
  - f. Certification of Fire Rated Plastic Laminate: Submit certification that plastic laminate assemblies specified as fire rated comply with Underwriters' Laboratory Class 1 rating and these Specifications.
- 3. Installer's Qualifications: Evidence of successful completion of work of similar scope to that shown and specified for this Project.
  - 4. Manufacturer's Qualifications: Evidence that the specified materials have been manufactured by the same source and successfully utilized for a minimum of 5 years on projects of a similar scope to that shown and specified for this Project.
- E. Closeout Submittals: Submit for Owner's documentation.
    - 1. Maintenance Manuals: Describing the materials, and procedures for cleaning and maintaining each metal type. Include manufacturer's data describing the materials and finishes used in the work including wood finishes, plastic laminate, solid surfacing, quartz surfacing, metal alloys, finishes, cabinet hardware and other major components and accessories.

## **1.6 QUALITY ASSURANCE**

- A. Qualified Installer: The architectural woodwork work shall be performed by an installer having 5 years experience in the installation of specified materials on comparable projects and shall have the approval of the architectural woodwork materials manufacturer.
- B. Single-Source Responsibility: Obtain architectural woodwork from one source of a single manufacturer. Obtain accessory products used in conjunction with architectural woodwork from the architectural woodwork manufacturer or from sources acceptable to the architectural woodwork manufacturer.
- C. Regulatory Requirements: Comply with applicable requirements of the laws, codes,



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ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from such authorities.

1. Locate the mock-ups where directed. Provide lighting of similar type and level as that of final installation for viewing. Demonstrate the proposed range of aesthetic effects and workmanship. Alter or revise mock-ups, as directed, to obtain the acceptance of the Owner and the Architect.
2. The accepted mock-ups shall serve as a standard of quality for specified item(s) for the project and may remain as a permanent part of the Work if in same condition as new at time of final acceptance. The approval of the mock-ups does not relieve the Contractor of its obligation to perform the work in accordance with the Contract Documents.

**1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Packing, Shipping, Handling, and Unloading: Protect architectural woodwork during transit, delivery, storage and handling to prevent damage. Cover and keep covered with non-staining protective wrapping.
- B. Storage and Protection: Store architectural woodwork in a dry, well-ventilated space, matching the environmental conditions of the finished installation.

**1.8 PROJECT/SITE CONDITIONS**

- A. Requirements:
  1. Conditioning of Woodwork: Condition woodwork to average prevailing humidity conditions in installation areas before installing.
  2. Maintain temperature and humidity levels in installation areas as required so as not to cause damage to installed items.
- B. Conditions Prior to Installation of Architectural Woodwork: Do not install architectural woodwork in any space until wet work in such space is dry to the satisfaction of the woodwork fabricator and installer, and only when the building's mechanical system can maintain the relative humidity and temperature at occupancy levels during the remainder of the construction period so that the woodwork will not be damaged by excessive changes. (Relative humidity and temperature at occupancy levels shall be agreed upon prior to installation of any architectural woodwork). Comply with AWS requirements as related to installation of architectural woodwork.

**PART 2 - PRODUCTS**

**2.1 WOOD MATERIALS**

- A. General
  1. Standards: In addition to requirements shown and specified, comply with applicable provisions for grading and workmanship of AWI "Quality Standards".
  2. Surfaces and Patterns: Provide lumber surfaced 4 sides (S4S) and worked to



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profiles shown or required.

3. Moisture Content: Kiln-dry lumber to the moisture content recommended by the AWS Section 2.

**B. Lumber: Comply with AWS Section 3 lumber grading rules with the following requirements:**

1. Hardwood for Transparent Finish: Premium Grade, select White Oak unless otherwise shown or specified, and free from catseyes, birdseyes, burls, splits, shakes, sap wood, wind checks, worm holes, resin deposits, mineral discolorations; hand selected to be uniform in color and grain characteristics and to match contiguous wood paneling.
  - a. Where hardwood is used adjacent to veneered wood, use solid wood of the same species, graining and other characteristics, from the same flitch as the wood veneer selected.
  - b. WD-01 – Rift Cut White Oak
  - c. WD-02 – Plain Sawn Maple
2. Hardwood for Opaque Finish: Custom Grade. Any hardwood which, when finished, will not show any grain, imperfection or other surface defects when used with the opaque finish specified.
3. Hardwood for Concealed Framing and Blocking: Custom or Economy Grade, any species.
4. Softwood for Transparent Finish: Premium Grade, Ponderosa Pine unless otherwise shown or specified.

**C. Core Types for Panel Products: AWS Section 4 with the following requirements:**

1. Medium Density Fiberboard: ANSI A208.2, either Medium Density or High Density Classification, made with binder containing no urea formaldehyde.
  - a. Grades
    - 1) Medium Density: Grade MD
    - 2) Moisture Resistant Grade: Grade MDF-Exterior Glue. Provide MD-Exterior Glue Grade for counter tops with sinks or other plumbing fixtures and countertops to receive stone surfaces).
  - b. Subject to compliance with requirements, provide one of the following:
    - 1) Medium Density Grade:
      - a) "Medite II" (Sierra-Pine Ltd.) or approved equal.
      - b) "Purekor Platinum MDF" (Panel Source International).



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- c) "Premium Standard (MDF) (Norbord Inc.).
- 2) Moisture Resistant Grade:
  - a) "Medex" (Sierra-Pine Ltd.) or approved equal.
  - b) "Moisture Resistant (MR) (Norbord Inc.).
- 2. Fire-Retardant Medium Density Fiberboard: Material is to contain 100% recycled content with at least 25% post-industrial recycled fiber. Provide panels complying with ANSI A208.2, grade as appropriate for intended application and that have fire-retardant chemicals bonded to softwood particles at time of panel manufacture to achieve products identical to those tested for compliance with UL Class 1 surface spread of flame per UL 753 Flame Rating Test and/or flame spread of 20 or less and for smoke developed of 25 or less per ASTM E84 by UL or other testing and inspecting organization acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing and inspecting organization. No added urea-formaldehyde is permitted. Provide one of the following or approved equal:
  - a. "Medite FR" (Sierra-Pine Ltd.).
  - b. "Pyroblock MDF Plus" (Panel Source International).
- 3. Particleboard: Shall not be used on the project.
- 4. Plywood: Either veneer core plywood or particle core plywood; fire retardant treated where required or shown. HPVA HP-1, made with adhesive containing no urea formaldehyde.
- D. Surface Grades of Panels
  - 1. Hardwood: AWS Section 4, Grade I and ANSI/HPVA-1, Grade AA; face veneers or overlays as shown or specified.
  - 2. Softwood: AWS Section 4, Grade I; face veneers as shown or specified.
  - 3. Edges: Band edges of plywood, and MDF board core panels with face veneer banding in accordance with AWS Section 4, Premium Grade, unless hardwood edge banding is shown. Provide special banding where shown.
  - 4. Panel Balancing Veneer: Provide balancing veneer on concealed side of panels, using same species as the face veneer.
- E. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln dried to less than 15 percent moisture content.
- F. Face Veneers for Transparent Finish: AWS Section 4, Grade AA of the following species and cut:
  - 1. WD-01A – Rift cut Oak to Match WD-01. Medullary ray fleck is not acceptable.

2. WD-02A – Plain sliced Maple to Match WD-02
- G. Face Veneers for Opaque Finish: AWS Section 4, Grade A or B, any hardwood veneer that, when finished, will not show any grain, imperfection or other surface defects when used with the opaque finish specified or phenolic resin impregnated paper, equal to "Forbond Yorkite III" (NVF Co., Primary Products Div.).

## **2.2 FIRE RETARDANT TREATMENT**

- A. Materials: Fire retardant materials shall meet the requirements of AWPA P49 and P50.
- B. Treatment: Pressure treat to meet requirements of AWPA U1. After fire retardant treatment, kiln dry to the moisture content specified. Do not use colorants in solution to distinguish treated lumber from untreated lumber. Guarantee fire retardant materials not to bleed through painted finish or natural finish. Provide the following:
  1. Interior Fire Retardant Treatment: For interior use where relative humidity is normally below 80%; Low-Hygroscopic Formulation; interior Type UCFA per AWPA U1. Provide fire retardant treatment from one of the following:
    - a. "D-Blaze" (J. H. Baxter Co.).
    - b. "D-Blaze" (Chemical Specialties, Inc.).
    - c. "Pyro-guard" (Hoover Treated Wood Products).
    - d. "Dricon" (Hickson Corp.).
  2. Exterior Fire Retardant Treatment: For exterior use and where relative humidity is frequently above 80%; Organic Resin-Based Formulation; exterior Type UCFB per AWPA U1 consisting of organic-resin solution, relatively insoluble in water, thermally set in wood by kiln drying. Provide fire retardant treatment from one of the following:
    - a. "FRX" (Hickson Corporation).
    - b. "Exterior Fire-X" (Hoover Treated Wood Products, Inc.)
- C. Procedures for Wood Before Treatment: Fabricate and mill wood before treatment wherever possible, and disassemble for treatment, so that cutting and jointing will not be required after treatment. Apply a heavy brush coat of the same fire retardant chemicals to any surfaces which are cut after treatment.
- D. Procedures for Kiln Drying: Kiln-dry woodwork after treatment to levels required for untreated woodwork. Maintain moisture content required by kiln drying before and after treatment.
- E. Defective Lumber: Discard treated lumber that does not comply with requirements of referenced woodworking standard. Do not use twisted, warped, bowed, discolored, or otherwise damaged or defective lumber.

## **2.3 SURFACING**

- A. Quartz Surfacing: Homogenous quartz material meeting ANSI Z124.6, Class I or Class A when tested in accordance with ASTM E84. Provide thicknesses, profiles and shapes as shown. Provide quartz surfacing from Zodiaq by DuPont, or equal, to match the following colors:
  - 1. Quartz Surfacing QTZ-01: Della Terra Quartz (Arizona Tile)
- B. Allow surfaces to acclimate in space a minimum 72 hours prior to installation.

## **2.4 METAL MATERIALS**

- A. Steel
  - 1. Structural Steel Shapes and Plates: ASTM A36 (A36M).
  - 2. Cold-Rolled Carbon Steel Strips: ASTM A109 (A109M).
  - 3. Cold-Rolled Carbon Steel Sheets: For concealed surfaces, commercial quality, ASTM A1008/A1008M; or structural quality, complying with ASTM A1008 (A1008M), Grade A, unless another grade is required by design loads. For exposed parts, open-hearth, full pickled, annealed, stretcher-leveled furniture steel, free of scale, waves and defects.
  - 4. Hot-Rolled Carbon Steel Sheets: Commercial quality, complying with ASTM A1011 (A1011M); or structural quality, complying with ASTM A1011 (A1011M), Grade 30, unless another grade is required by design loads, may be used for concealed parts only.
  - 5. Steel Bars: Cold-finished, carbon steel, ASTM A108, hot-rolled.
  - 6. Rolled Steel Formed Channels: AISI MT-1010, cold-rolled steel, best commercial grade.
  - 7. Steel Tubing: ASTM A500 cold-rolled steel seamless welded, best commercial grade, not less than 0.065 in. (1.7mm) thick.
- B. Stainless Steel
  - 1. ASTM A240 (A240M); Provide the most suitable austenitic alloy, form and finish required to produce the Work. Provide Type 304 or Type 316 and low carbon Type 304L or 316L for components to be welded, unless otherwise noted.
    - a. Plate and Sheet: ASTM A480 (A480M), Stretcher level sheets.
    - b. Bar Stock and Shapes: ASTM A276.
    - c. Round, Square and Rectangular Welded Tubing: ASTM A554, Grades MT 301, MT 302, or MT 304, as standard with manufacturer.
    - d. Pipe: ASTM A312 (A312M), Grade TP 304.

- e. Castings: ASTM A743 (A743M), Grade CF8 or CF20.
- C. Bronze
  - 1. Extrusions: Architectural bronze, CDA alloy 385.
  - 2. Extrusions: Leaded commercial bronze, CDA alloy 314.
  - 3. Sheet and Roll-Formed: Muntz metal, CDA alloy 280, stretcher leveled panel quality composed of 60% copper and 40% zinc.
  - 4. Sheet and Roll-Formed: Commercial bronze, CDA alloy 220, stretcher-leveled panel quality composed of 90% copper and 10% zinc.
- D. Brass
  - 1. Cartridge Brass, CDA alloy 260, composed of 70% copper and 30% zinc; free from scratches, porosity, non-conducting inclusions, roll and die marks, cold shuts, cracks or other defects.
- E. Aluminum: Provide alloy and temper recommended by aluminum producer or finisher for type of use and finish indicated, and with not less than the strength and durability properties of the alloy and temper designated below for each aluminum form required.
  - 1. Extruded Bar and Shapes: ASTM B221 (B221M), 6063-T6.
  - 2. Extruded Pipe and Tube: ASTM B 429, 6063-T6.
  - 3. Drawn Seamless Tube: ASTM B483 (B483M), 6063-T832.
  - 4. Plate and Sheet: ASTM B209 (B209M), 6061-T6.
  - 5. Die and Hand Forgings: ASTM B247 (B247M), 6061-T6.
  - 6. Castings: ASTM B26 (B26M), 356.0-T6.

## **2.5 ARCHITECTURAL WOODWORK HARDWARE**

- A. Architectural Woodwork Hardware: Provide architectural woodwork cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Section 08 70 00 "Hardware". Obtain architectural woodwork cabinet hardware for each category from a single manufacturer. Specified manufacturers and their product catalog numbers establish the standard of quality and design required for the various categories, and equivalent products by other manufacturers may be acceptable, subject to Architect's review of their equivalency. Comply with BHMA A156.9 except as otherwise specified; provide the following items, or their approved equal, as required:
  - 1. Frameless Concealed Cabinet Door Hinges: BHMA A156.9, B01602; self-closing unless otherwise shown or specified; provide one of the following:
    - a. Manufacturers:



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- 1) "3903 Snap-On 3000 Concealed Hinges" (Grass); 165° opening; self-closing.
  - 2) "Clip 170 Self-Closing" (Blum); 170° opening; self-closing.
  - 3) "F 65 CS 170°" (Mepla-Alfit); 170° opening; self-closing.
  - b. Hinge Quantity:

Door Height (Max.)	Door Width (Max.)	Hinges Per Door
30 in. (750mm)	24 in. (600mm)	2
30 in. (750mm)	36 in. (900mm)	3
  - c. Where cabinet doors exceed the dimension in height in the above "Hinge Quantity Schedule," or weight exceeds 20 lbs (8kg) per door, provide hinge quantity as recommended by hinge manufacturer.
2. Catches:
- a. Magnetic Type: BHMA A156.9, B03141; Provide one of the following unless otherwise shown or specified:
    - 1) "#541" (Epc).
    - 2) "#325" (H.B Ives).
  - b. Push-In Magnetic Type: BHMA A156.9, B03131; Provide one of the following unless otherwise shown or specified:
    - 1) "#507" (Epc).
  - c. Roller Type: BHMA A156.9, B03071; unless otherwise shown. Provide one of the following unless otherwise shown or specified:
    - 1) "#505NP" (Epc).
    - 2) "#245.55.913" (Hafele).
  - d. Ball Friction Type: BHMA A156.9, B03013; unless otherwise shown. Provide one of the following unless otherwise shown or specified:
    - 1) "#1011" (Epc).
    - 2) "#241.80.505" (Hafele).
3. Latches: Touch activated type; Provide one of the following unless otherwise shown or specified:
- a. "Magna Latch M-559-Round White" (Selby)
  - b. "7007WH Magnetic Touch Latches, White" (Wood Technologies, Inc.).





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4. Felt Silencers: Provide felt silencers on jamb and/or head and sill strike areas of cabinet doors; 4 for paired doors, 3 for single leaf doors.
5. Wire Pulls: "Item No. DP57B" (Doug Mockett & Company, Inc), "Item No. 116.39.464" (Hafele), "Item No. 4676.264" (Baldwin), or approved equal.
6. Flush Pulls: "Item No. 1060" (Trimco), "Item No. 151.09.609" (Hafele), or approved equal.
7. Locks: Comply with BHMA A156.11 and the following:
  - a. Drawer Locks: BHMA A156.11, E07041; Provide 2 keys with each drawer lock, master keyed as directed by Owner; Provide one of the following:
    - 1) "232.04.622" (Hafele); matte nickel plated finish having 200 possible key changes. Provide "219.19.675" (Hafele); matte nickel plated cylinder rosette.
    - 2) # CB-281 Cylinder Body" (CompX Timberline).
  - b. Cabinet Door Locks: BHMA A156.11, E07121; Provide 2 keys with each cabinet door lock, master keyed as directed by Owner; Provide one of the following:
    - 1) "235.04.609" (Hafele); matte nickel plated finish having 200 possible key changes. Provide "219.19.675" (Hafele); matte nickel plated cylinder rosette.
    - 2) # CB-231 Type 231 Cylinder Body" (CompX Timberline).
8. Drawer Slides: BHMA A156.9, B05091; full-extension, zinc-plated steel drawer slides with steel ball bearings, provide the following:
  - a. Pencil Drawer Slides: "Model No.2632" (Accuride) up to 75 lbs. (34kg), full extension, rail mount, for shallow drawers up to 3 in. (75mm) deep.
  - b. Box Drawer Slides: "Model No. 7432" (Accuride) up to 100 lbs. (45kg); full extension, progressive movement, rail mount, for drawers up to 24 in. (600mm) wide.
  - c. File Drawer Slides: "Model No. 4034 (Accuride) up to 150 lbs (68kg) and max. 30 in. (750mm) drawer width; and "Model No. 3640 (Accuride) up to 200 lbs (91kg) and drawer width 30 in. (750mm) and up.
9. Grommets: Size and location as shown; plated steel grommet with polished chrome finish unless otherwise shown or specified; for flush mounting with adjacent counter tops. Provide one of the following:
  - a. "PS Series" (Doug Mockett & Co.).
  - b. "Classic Series No. 079" (Hardware Concepts, Inc.).



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10. Metal Shelf Supports: BHMA A156.9, B04071; with shelf rests, B04081; BHMA A156.9, B04102; with shelf brackets, B04112.
11. Surface Mounted Standards and Brackets: One of the following as required for loading condition shown, with manufacturer's standard caps at top and bottom where shown, and screw mounted shelf rests as required for condition of use:
  - a. Medium Duty: "No. 102 standards and No. 1706 brackets" (Capitol Hardware) or "No. 80 standards and No. 180 brackets" (Knape & Vogt Mfg. Co.).
  - b. Heavy Duty: "No. 2000 standards and No. 2001 brackets" (Capitol Hardware) or "No. 87 standards and No. 187 brackets" (Knape & Vogt Mfg. Co.).
  - c. Flush Mounted Medium Duty Standards: "No. 74" (Capitol Hardware) or "No. 71" (Knape & Vogt Mfg. Co.).
  - d. Cabinet Shelf Supports: "No. 256" (Knape & Vogt Mfg. Co.) for use with "No. 255 Flush Mount Standards" (Knape & Vogt Mfg. Co.).
  - e. Metal Shelf Supports: "Magic Wire" (Selby Furniture Hardware Company). Size as required to support full width of shelf.
  - f. Cabinet Shelf Supports: "No. 282.11.761 " Hafele) or approved equal.
  - g. Finish
    - 1) Satin Chrome.
12. Hang Rods: Tubing and end flanges to suit diameter of tubing where shown, including accessories. Provide one of the following:
  - a. "No.646-2, 1-5/16 in. (32.5mm) o.d. bright chrome plated steel tubing" and "No. 654-2" (Capitol Hardware) steel with satin chrome plated finish.
  - b. "770, 1-5/16 in. (32.5mm) o.d. bright chrome plated steel tubing" & "764 end flanges (Knape & Vogt).
13. Architectural Woodwork Hardware Finishes: For exposed architectural woodwork hardware, provide finish that complies with ANSI/BHMA A156.18 for BHMA code number indicated.
  - a. Satin Chromium Plated, Steel Base: BHMA 652.
  - b. Satin Stainless Steel, Stainless Steel Base: BHMA 630.
  - c. Polished Stainless Steel, Stainless Steel Base: BHMA 629 (US 32).
  - d. Dark Oxidized Satin Bronze, Oil Rubbed, on Bronze Base: BHMA 613 and matching Architect's sample.

- e. Satin Chromium Plated, Brass or Bronze Base: BHMA 626.
  - f. For concealed hardware provide manufacturer's standard finish that complies with product class requirements of ANSI/BHMA A156.9.
- B. Closet and Storage Shelving (Wire Type)
- 1. Type "A": Epoxy plastic or vinyl coated ventilated welded steel open rod shelving system complete with all brackets and accessories; one of the following:
    - a. "Sani-Shelf" (Schulte Corp.).
    - b. "Closet Maid" (Closet Maid/Clairson International).
  - 2. Type "B": Ventilated welded stainless steel open rod shelving system complete with all brackets and accessories; "Regular Erecta Shelf" (InterMetro Industries Corp.) or approved equal.

## **2.6 FASTENERS AND ANCHORAGES**

- A. Fasteners
- 1. Screws: Select material, type, size, and finish required for each use. Comply with ASME B18.6.1 for applicable requirements. For metal framing supports, provide screws as recommended by metal-framing manufacturer.
  - 2. Nails: FS FF-N-105, type, size, material and finish as required for the condition of use.
- B. Anchors: Type, size, material and finish as required for the condition of use capable of sustaining, without failure, the load imposed within a safety factor of 4 as determined by tested in accordance with ASTM E448. Provide nonferrous metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts and anchors, as required, to be set into concrete or masonry work for subsequent woodwork anchorage.
- C. Staples: Upholstery type staples of sufficient strength to hold fabric taut in place without sagging.
- D. Panel Clips: Aluminum interlocking offset panel fasteners; type, size and quantity for the condition of use. Provide the following or approved equal:
- 1. "Panel "Z" Clips" (Monarch Metal Fabrications Inc.).
  - 2. "ZC3 Clips" (Doug Mockett & Co., Inc.).
  - 3. "Panelclip" (Brooklyn Hardware, LLC).
- E. Blind Splines and Draw Downs: Specialty devices, as required for tight butt joining, types and size as recommended by woodwork fabricator. Where mortises of fastener heads, or draw downs are exposed (blind holes) in finished work, provide plastic cover caps, color

as selected by Architect.

## **2.7 AUXILIARY MATERIALS**

- A. For Laminating Plastic Laminate Surfaces: Unpigmented contact cement, phenol-resin, phenol-formaldehyde or resorcinol-resin complying with FS MMM-A-181; type, grade and class best suited for the purpose.
- B. For All Other Uses: Moisture resistant complying with FS MMM-A125, Type II, or MMM-A-188, Type I, II or III; type best suited for the purpose.
- C. Rough Carpentry: As specified in Section 06 10 00 "Rough Carpentry".
- D. Glass and Glazing: As specified in Section 08 80 00 "Glazing".
- E. Sealants: As specified in Section 07 92 00 "Joint Sealants".

## **2.8 FABRICATION - GENERAL**

- A. Premium Grade Architectural Woodwork: Provide premium grade architectural woodwork complying with the referenced Architectural Woodwork Standards (AWS) unless otherwise specified.
- B. Steel Framing, Lumber Framing, Bracing and Fastening Devices: Provide steel framing and lumber framing for architectural woodwork, complete with bracing and fastening devices as required for a rigid installation, and as required to sustain the imposed loads. Do fabrication from field measurement with provision for scribing as required to meet built-in conditions. Coordinate the work of this Section with the work of other trades.
- C. Instructions for Fabrication of Units: Fabricate units in largest practicable sections. Assemble in the shop for trial fit, disassemble for shipment and reassemble with concealed fasteners. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
- D. Compliance with AWS: Comply with requirements of referenced AWS quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas. Maintain relative humidity and temperature during fabrication, storage and finishing operations matching that of the areas of installation.
- E. Details and Modifications: Details indicate the required type and quality of construction. Modifications to conform to manufacturer's standards will be considered providing they comply with the Contract Documents, maintain the profiles shown and subject to acceptance by the Architect.
- F. Reinforcing: Reinforcing shown is minimum. Provide additional reinforcing as required to ensure a rigid assembly. Exposed surfaces shall be free from dents, tool marks, warpage, buckle, glue and open joints, or other defects affecting serviceability or appearance. Accurately fit joints, corners and miters. Conceal all fasteners. Make threaded connections up tight so that threads are entirely concealed.
- G. Welds and Brazes: Welding and brazing shall be of adequate strength and durability with joints tight and flush, smooth and clean. All exposed surfaces shall be ground and finished flush, free of weld marks. Welds or brazes on finished surfaces shall be

indistinguishable from parent metal.

- H. Finish, Touch-up, Cleaning and Polishing: Factory finish items where possible. Defer final touch-up, cleaning and polishing after delivery and installation.
- I. Surface Preparation: Comply with AWS Section 6, Premium Grade for sanding, filling countersunk fasteners and other preparations for the finishing of architectural woodwork, as applicable to each unit of work with the following additional requirements for final preparation of wood surfaces for finishes:
  - 1. Sanding: Use 220 grit for exposed surfaces and 180 grit for semi-exposed surfaces. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.
  - 2. Countersinkages in finished surfaces will not be permitted in the finished work except as specifically directed by the Architect. In such cases countersinkages shall be filled with wood putty tinted to blend with the adjacent wood veneer.
  - 3. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication
- J. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
  - 1. Corners of cabinets and edges of solid wood (lumber) members less than 1 in. (25mm) in. in nominal thickness: 1/16 in. (1.5mm).
  - 2. Edges of rails and similar members more than 1 inch in nominal thickness: 1/8 in. (3mm).
- K. Provide finishes as shown or specified.
- L. Veneers for Transparent Finish
  - 1. The Architect will assign specific flitches for specific elevations.
  - 2. Bond veneers to cores by the hot press method.
  - 3. All full width panels shall be center book matched and end matched.
  - 4. Full width panels 40 in. (1000mm) or less in width shall be:
    - a. 4 piece matched for quarter sliced veneer species (narrow leaf veneers).
    - b. 2 piece matched for plain sliced veneer species (wide leaf veneers).
    - c. 1 piece matched for special, extra wide leaf veneer species.
  - 5. Full width veneers of width greater than 40 in. (1000mm) shall have number of leaves in panel assigned on an individual species and flitch basis.
  - 6. Panels shall be blueprint, balanced and sequence matched and full flitch matched, with sapwood removed.



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**2.9 FABRICATION - SPECIFIC ITEMS**

**A. Architectural Cabinetwork**

1. Provide cabinetwork in accordance with AWS Section 10, Premium Grade, for wood cabinetwork and plastic laminate cabinetwork.
  - a. Provide "Flush Overlay" AWS type cabinet construction unless otherwise noted.
2. Include preparations for mechanical, electrical, telephone, computer equipment and plumbing work required. Prepare cabinets, which contain computer equipment, to receive cooling fans, air slots for air circulation within the equipment area of sizes as shown or required and wireways for electrical, data and communication wires. Allow for cable conduits entering casework from different directions. In areas where shown or required, provide removable panels and access doors.
3. Provide cabinet hardware as shown or specified.
4. Provide dust panels of 1/4 in. (6mm) plywood or tempered hardboard above compartments in body webs and drawers except where located directly under tops.
5. Semi-Exposed Surfaces
  - a. Semi-exposed surfaces of wood cabinetwork shall be provided with melamine. Drawer sides and backs shall be solid hardwood lumber, primed and painted, shop finished. Drawer bottoms shall be hardwood plywood, painted white, shop finished.
6. Provide wood veneers for exposed surfaces as specified hereinbefore.
7. Hollow core doors will not be permitted.
8. Provide matching veneers for edge treatments of case body members where transparent finishes are indicated or specified or plastic edge banding matching the color of the semi exposed surface.
9. Provide drawers with slides as specified. Drawers shall not rest on web body frames.

**B. Countertops**

1. Fabricate countertops of sizes and profiles shown, not a part of integral casework, in accordance with AWS Section 11, Premium Grade, and as specified herein.
2. Provide countertops fabricated with either veneer core or particle core plywood cores for all locations, except provide either exterior veneer core or phenolic resin particleboard core plywood cores for counter tops with sinks or other plumbing fixtures and countertops to receive stone surfaces.

3. Where shown, provide countertops fabricated of quartz surfacing, 3/4 in. (19mm) thick, of sizes and profiles shown with cutouts where required to accommodate items penetrating the surface. If required use 2 sheets of countertop sheet material laminated together using standard adhesive to form edges. Laminated sections shall be in close contact throughout. Adhesive stains will not be permitted. Route out backs of countertops where required to receive, lavatories, faucets and soap dispenser toilet accessories. Provide recommended undermount hardware for bowls and sinks where required. Obtain templates from other trades as required for preparation of cutouts.
  - a. Install integral sink bowls in countertops in the shop.
4. Provide countertops in longest length possible for each location shown.
5. Provide wood blocking and framing, anchors, clips, splines, supporting and attaching devices.
6. Provide cut-outs to receive attachments, supporting substructure, mechanical and electrical work from templates and drawings furnished by other trades. Provide grommets in locations where wiring enters or exits from countertop.
7. Provide balancing face, on concealed side of countertops, of same thickness and material as specified for face, except concealed grade, to equalize pull and prevent warpage, twist or bow.
8. Provide fascias, skirts or backsplashes of profiles and sizes shown, and shop assembled with countertops.

**C. Paneling**

1. General
  - a. Panels shall be in accordance with AWS Section 8, Premium Grade construction.
  - b. Panel joints shall be flush type unless otherwise shown or specified.
  - c. Provide wood blocking and framing, anchors, clips, splines, supporting and attaching devices.
2. Provide cut-outs to receive attachments, mechanical and electrical work as required. 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. Smooth edges of cutouts.
  - a. Provide balancing veneer on concealed side of panels, using same species as the face veneer, to equalize pull.
  - b. Provide panel clips in quantity and spacing to sustain loading and prevent warping and bowing of panels.



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3. Wood Veneer Paneling
  - a. Comply with AWS Section 8, Premium Grade.
  - b. Provide veneers and finishes as specified and as shown, including matching requirements.
4. Stile and Rail Paneling
  - a. Comply with AWS Section 8, Premium Grade. Provide any closed-grain hardwood complying with referenced standard.
  - b. All exposed edges of panel cores shall be edge banded.
  - c. Grain direction shall be as shown.
  - d. Backout or groove backs of flat trim members and kerf backs of other wide flat members, except for members with ends exposed in finished work. Assemble casings in plant except where limitations of access to place of installation require field assembly.
- D. Wood Bases: Provide solid hardwood base in profiles and locations indicated on Drawings. Where indicated to be painted, provide local hardwood species finished to match wood type finishes indicated. Where indicated to be WD-01 Oak base, finish to match existing with transparent finish.
- E. Closet and Storage Shelving
  1. Provide closet and storage shelving in accordance with AWS Section 6, Custom Grade, unless otherwise shown or specified.
  2. Shelf Cleats: 3/4 in. (19mm) x 3-1/2-in. (90mm) boards with holes to receive clothes rods (if shown or required), of same species and grade indicated above for interior lumber trim for opaque finish.
  3. Exposed edges shall have hardwood edge bands.
  4. For sizing of shelves and spacing of supports, comply with AWS Section 6. Shelf deflection shall not be greater than 1/4 in. (6mm) between supports.
- F. Standing and Running Trim: Provide standing and running trim of the sizes, profiles, species and finish as specified or shown and complying with AWS Section 6, Premium Grade.
- G. Wood Doors: Fabricate wood doors in accordance with the requirements of Section 08 14 00 "Wood Doors" and AWS Section 9, Premium Grade for flush type doors and stile and rail type doors.
  1. Provide veneer species and finish as specified or shown.

**2.10 WOOD FINISHES**



- A. Transparent Finishes: Comply with requirements indicated below for grade, finish system, staining, and sheen, with sheen measured on 60-degree gloss meter per ASTM D523:
1. Grade: Premium
    - a. AWS Finish System: Synthetic Penetrating Oil and Simulated Oil Finish.
  2. AWS Finish System: Nitrocellulose Lacquer.
  3. AWS Finish System: Catalyzed Lacquer.
  4. AWS Finish System: Water-reducible acrylic lacquer.
  5. AWS Finish System: Conversion Varnish.
- B. Transparent Finish: Clear nitrocellulose lacquer, to a cured film thickness of 1 mil (25µm). Prior to application of finish prepare wood surfaces with oil stains, water-based aniline stains or toners as required to match approved sample. Specular gloss as selected by the Architect.
1. Transparent Finish: Open pore rubbed lacquer finish consisting of bleaching, as may be required, aniline stains and toners, clear sealer coats, clear lacquer coats, rubbed and waxed. Between each coat sanding is required so that the final finish shall match the sample on file in the Architect's office.
  2. Transparent Finish: Closed pore rubbed lacquer finish consisting of bleaching and paste wood fillers, as may be required, aniline stains and toners, clear sealer coats as required to achieve a closed pore finish, clear lacquer coats, rubbed and waxed. Between each coat sanding is required so that the final finish shall match the sample on file in the Architect's office.
  3. Transparent Polyester Finish: A closed pore finish consisting of bleaching and paste wood fillers, as may be required, aniline stains and toners, and multiple coats of polyester resin comparable to "Ceraglaze" (Titanine Division of Seagrave Corp.).
    - a. Prepare the substrate as recommended by the finish manufacturer.
    - b. Sap stain as required to match color of sample on file, using alcohol type, non-bleeding, non-grain raising stain.
    - c. 1st and 2nd Coats (each coat consisting of two passes at right angles to each other): Transparent barrier coat "6315C" and light polyurethane converter as recommended by the finish manufacturer.
      - 1) 3rd, 4th and 5th Coats (each coat consisting of two passes at right angles to each other): Transparent polyester resin curved as required to achieve final finish.
    - d. Four Final Coats (each consisting of two passes at right angles to each other): Transparent polyester resin to a total wet film thickness of



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- 10 mils (250 $\mu$ m) minimum, dried and cured.
- e. Sand, wet rub and buff to finish matching gloss of samples on file in the Architect's office.
  - f. Follow finish manufacturer's recommendations for the details of application of the elements of the above system.
4. Transparent Polyurethane finish: Provide transparent polyurethane finish complying with AWS Section 5, Catalyzed Polyurethane Finish System, except non-catalyzed polyurethane utilizing "Varathane, #90 Gloss" (Rust-Oleum) clear liquid plastic.
- C. Opaque Finishes: Comply with requirements indicated below for grade, finish system, staining, and sheen, with sheen measured on 60-degree gloss meter per ASTM D523:
- 1. Grade: Premium
  - 2. AWS Finish System: Nitrocellulose Lacquer.
  - 3. AWS Finish System: Catalyzed Lacquer.
  - 4. AWS Finish System: Acrylic Lacquer.
  - 5. AWS Finish System: Conversion Varnish.
  - 6. AWS Finish System:
  - 7. Opaque Lacquer Finish
    - a. Polish finished substrates to eliminate marks and sander scratches and wipe clean prior to application of undercoater.
    - b. 1st Coat: Alkyd resin or nitrocellulose lacquer base, 65% solids, opaque undercoater, color best suited to achieve final color appearance of subsequent coats, with a cold check cycle of 16.
    - c. 2nd Coat: Opaque lacquer, nitrocellulose plasticizer base, 45% solids, color and specular gloss as selected by the Architect, with a cold check of 20.
    - d. 3rd Coat: Clear catalyzed lacquer, alkyd urea base modified nitrocellulose resin, 26% solids, specular gloss as selected by Architect, with a cold check of 15.
    - e. Total dry film thickness between 3 (75 $\mu$ m) and 5 mils (125 $\mu$ m).
    - f. Final finish shall match sample on file in the Architect's office.
  - 8. Opaque Polyester Finish: A closed pore finish of multiple coats of polyester resin comparable to "Ceraglaze" (Titanine Division of Seagrave Corp).

- a. Prepare the substrate as recommended by the finish manufacturer.
  - b. 1st and 2nd Coats: Lacquer primer sealer, color best suited to achieve final color of subsequent coats. Sand between coats.
  - c. 3rd, 4th and 5th Coats: Polyester resin, color as selected, oven dried and cured as required to achieve the final finish.
  - d. Provide four final coats of polyester resin, color as selected, dried and cured to a total film thickness of 10 mils (250µm).
- D. Paint finish is applied in the field and is specified in Section 09 91 00 "Painting".
- E. Unexposed Wood Finish: Alkyd type primer-sealer.

## **2.11 METAL FINISHES**

- A. General: As shown for the respective units and matching the reviewed samples. Remove scratches, abrasions, dents, die markings and other defects prior to finishing operations. Perform this work in addition to finish treatment specified. Comply with NAAMM "Metal Finishes Manual" for finish designations and application recommendations unless otherwise specified.
- B. Refer to 05 70 00 "Decorative Metal" for metal finishes.

## **PART 3 - EXECUTION**

### **3.1 GENERAL**

- A. Manufacturer's Instructions: Prepare substrates, and install the work of this Section, including equipment, components, and accessories in accordance with the manufacturer's instructions, except where more stringent requirements are shown or specified, and where project conditions require extra precautions or provisions to ensure satisfactory performance of the Work.

### **3.2 EXAMINATION**

- A. Verification of Conditions: Examine the areas to receive the Work and the conditions under which the Work would be performed. Remedy conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.
  - 1. Verify locations of concealed framing, blocking, reinforcements, and furring that support woodwork by accurate field measurements before being enclosed. Record measurements on final shop drawings.
  - 2. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that architectural woodwork can be supported and installed as indicated.
- B. Condition woodwork to average prevailing humidity conditions in installation areas before installing.

### **3.3 PREPARATION**

- A. Substrate Acceptability: Commencement of installation shall constitute acceptance of substrate conditions by the Installer.
- B. Coordination: Coordinate architectural woodwork with the adjacent work of other sections. Provide items to be placed during the installation of other work at the proper time to avoid delays. Coordinate placement of such items, including inserts and anchors, accurately in relation to the final location of architectural woodwork.

### **3.4 INSTALLATION**

- A. General: Install architectural woodwork in accordance with AWS, Premium Grade.
  - 1. Coordinate installation with the work of other trades to ensure exact fit and perfect alignment. Verify dimensions before proceeding and obtain measurements at job site for work required to be accurately fitted to other construction.
  - 2. Install work plumb, level, true and straight with no distortions. Provide shims as required. Cutting, trimming, fitting and matching of prefinished work will not be permitted. Where cutting is required, scribe to fit adjoining work so as not to damage finished surfaces.
  - 3. Securely fasten architectural woodwork items to blocking with concealed fasteners only. Where surface nailing is required, countersink and fill flush with the woodwork so that the finished heads are undetectable. Architectural woodwork which has integrated electrical supply and/or devices shall be rigidly secured to structural slab.
  - 4. Install materials utilizing materials and methods as recommended by manufacturer unless otherwise specified.
  - 5. Fire-Retardant-Treated Wood: Handle, store, and install fire-retardant-treated wood to comply with recommendations of chemical treatment manufacturer, including those for adhesives used to install woodwork
- B. Casework: Install cabinets and casework in accordance with AWS Section 10. Install and adjust cabinetry and casework so that the doors and drawers are centered, operate smoothly and within the permissible tolerances. Field adjust plant hinged doors to meet plant tolerances.
  - 1. Provide cabinetry complete with blocking, framing, supports and bracing as required for a safe, rigid assembly. Install cabinets with no more than 1/8 in. (3mm) in 96 in. (3m) sag, bow, or other variation from a straight line. Coordinate with the work of electrical and mechanical trades and other trades as required for a complete installation.
  - 2. Install shelving brackets, standards, and cabinet shelf supports as recommended by manufacturers of these products and as required for intended use.
- C. Countertops: Anchor securely by screwing through corner blocks of base cabinets or



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other supports into underside of countertop. Install countertops with no more than 1/8 in. (3mm) in 96 in. (3m) sag, bow, or other variation from a straight line. If backsplashes are indicated, secure to tops with concealed metal brackets at 16 in. (400mm) o.c. and to walls with adhesive. Seal space between backsplash and wall with sealant specified in Section 07 92 00 "Joint Sealants."

- D. Stone Countertops: Install stone countertops over plywood substrate with full spread of water-cleanable epoxy adhesive. Set stone to comply with requirements indicated on Drawings and Shop Drawings. Shim and adjust stone to locations indicated, with uniform joints of widths indicated and with edges and faces aligned according to established relationships and indicated tolerances. Bond joints with stone adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears. If backsplashes are indicated, install backsplash and end splash by adhering to countertops and wall surfaces with stone adhesive. Leave 1/16 in. (1.5mm) gap between splash and wall for filling with sealant. Use temporary shims to ensure uniform spacing. Apply stone sealer to comply with stone producer's and sealer manufacturer's written instructions.
- E. Paneling: Install paneling in accordance with AWS Section 8 and as follows:
1. Provide a system of concealed panel hanger clips and corresponding wall clips to support the panel system. Face nailing shall not be permitted.
  2. Install paneling in the designated locations level, plumb, true, and straight with no distortions. Shim as required with concealed shims. Scribe and cut panel work to fit adjoining work, and refinish cut surfaces and repair damaged finish at cuts. Panels shall be straight, level, flat and flush with adjoining panels. Install to a tolerance of 1/8 in. (3mm) in 96 in. (3m) for plumb and level. Install with no more than 1/16 in. (1.5mm) in 96 in. (3m) vertical cup or bow and 1/8 in. (3mm) in 96 in. (3m) horizontal variation from a true plane.
  3. Where reveals are indicated, keep panels spaced so that reveals are parallel and of widths shown.
- F. Wood Bases
1. Stagger joints in adjacent and related members. Cope at returns, miter at corners to produce tight fitting joints with full surface contact throughout length of joint. Use scarf joints for end to end joints. Plane backs of casings to provide uniform thickness across joints, if required. Miter cut all running joints, butt joints are prohibited. Cut running joints away from direction of major view.
  2. Drill pilot holes in hardwood before fastening to prevent splitting. Fasten to prevent movement or warping. Countersink fastener heads on exposed carpentry work and fill holes.
  3. Install wood bases and trim after gypsum board joint finishing operations are completed.
- G. Closet and Storage Shelving: Provide closet and storage shelving at the locations shown. Provide hang rods where shown. Set adjustable center hangers.

- H. Standing and Running Trim: Install standing and running trim in accordance with AWS Section 6. Install with minimum number of joints possible, using full length pieces for each run.
1. Stagger joints in adjacent and related members. Cope at returns, miter at corners to produce tight fitting joints with full surface contact throughout length of joint. Use scarf joints for end to end joints. Plane backs of casings to provide uniform thickness across joints, if required.
  2. Miter cut all running joints, butt joints are prohibited. Cut running joints away from direction of major view.
  3. Install standing and running trim after gypsum board joint finishing operations are completed.
  4. Drill pilot holes in hardwood before fastening to prevent splitting. Fasten to prevent movement or warping. Countersink fastener heads on exposed carpentry work and fill holes.
- I. Install glass to comply with applicable requirements in Section 08 80 00 "Glazing" and in GANA's "Glazing Manual." For glass in wood frames, secure glass with removable stops.

### **3.5 ADJUSTING**

- A. Adjust installation to provide uniform clearances and smooth non-binding movement of operable parts. Upon completion of the Work repair surfaces that have been permanently stained, marred, or otherwise damaged. Replace Work which is damaged or cannot be adequately cleaned as directed

### **3.6 CLEANING**

- A. Upon completion of the Work, remove unused materials, debris, containers and equipment from the project site. In addition to the initial cleaning procedure required, and not more than 2 days before occupancy by the Owner, clean the Work as recommended by the manufacturer.

### **3.7 PROTECTION**

- A. Damage Prevention: Protect architectural woodwork so that it will be without damage at the time of acceptance.
- B. Repairing of Damage: Touch-up marred finishes to match adjacent surfaces perfectly.
1. Architectural woodwork which, in the opinion of the Architect, cannot be satisfactorily refinished in the field shall be removed and replaced, with units to match contiguous architectural woodwork in all respects.

**END OF SECTION**

**SECTION 07 14 13  
HOT FLUID-APPLIED RUBBERIZED ASPHALT WATERPROOFING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. General: Provide hot fluid-applied rubberized asphalt waterproofing in new planters.
- B. Related Work Specified Elsewhere:
  - 1. Section 01 81 13 "Sustainable Design Requirements" for additional references, definitions, documentation requirements, action plans, meetings, and performance requirements of products and systems.
  - 2. Building insulation is specified in Section 07 23 00 "Building Insulation".

**1.2 REFERENCES**

- A. General: Comply with the applicable provisions of the referenced standards except as modified by governing codes and the Contract Documents. Where a recommendation or suggestion occurs in the referenced standards, they shall be considered mandatory. In the event of conflict between referenced standards, this specification or within themselves, the more stringent standard or requirement shall govern.
- B. Canadian General Standards Board (CGSB): CGSB 37.50-M89, "Hot-Applied, Rubberized Asphalt for Roofing and Waterproofing"
- C. National Roofing Contractor's Association: The NRCA Roofing and Waterproofing Manual.

**1.3 SUBMITTALS**

- A. Product Data: Submit for Architect's action. Submit manufacturer's literature and specifications describing the general properties of each material and accessory to be used in the Work.
  - 1. Submit manufacturer's installation instructions for the hot fluid-applied rubberized asphalt waterproofing system and other data as may be required to show compliance with the Contract Documents.
  - 2. Indicate by transmittal form that a copy of manufacturer's installation details have been sent to the applicator.
- B. Closeout Submittals
  - 1. Warranties: Special warranties as specified.

**1.4 QUALITY ASSURANCE**

- A. Qualified Applicator: The hot fluid-applied rubberized asphalt waterproofing work shall be performed by an applicator with a minimum of 5 years experience in the installation of materials specified on projects comparable in scope to this Project. The applicator shall have the approval of the hot fluid-applied rubberized asphalt waterproofing materials



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manufacturer.

- B. Manufacturer Qualifications: Materials shall have been manufactured by the same source and successfully utilized on a yearly basis for a minimum of 5 years on projects of a similar scope to that shown and specified for this Project.
- C. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from authorities having jurisdiction.
- D. Pre-Installation Meeting: Prior to the start of the Work meet at the Project site to review methods and sequence of hot fluid-applied rubberized asphalt waterproofing installation, special details and conditions, standard of workmanship, testing and quality control requirements, job organization and other pertinent topics related to the Work.

**1.5 DELIVERY, STORAGE AND HANDLING**

- A. Packing, Shipping, Handling, and Unloading: Deliver materials in manufacturer's unopened containers identified with brand name, type, grade, class and other qualifying information.
- B. Storage and Protection: Store materials in a dry location, in a manner as to prevent damage or intrusion of foreign matter and in accordance with manufacturer's instructions. Conspicuously mark "Rejected" on materials which have once been wet or damaged and remove from the job site.

**1.6 PROJECT/SITE CONDITIONS**

- A. Weather Conditions: Proceed with hot fluid-applied rubberized asphalt waterproofing and associated work only when weather conditions will permit unrestricted use of materials and adequate quality control of work being installed, in compliance with requirements and with recommendations of primary materials manufacturers.

**1.7 WARRANTY**

- A. General: Warranties and guaranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and are in addition to and run concurrent with other warranties and guaranties made by the Contractor under requirements of the Contract Documents.

**PART 2 - PRODUCTS**

**2.1 MATERIALS**

- A. Hot Rubberized Asphalt Waterproofing Membrane: Hot melt rubberized asphalt, 100% solids, complying with CAN/CGSB-37.50M; one of the following:
  - 1. "FR System" utilizing "Liquid Membrane 6125" (American Hydrotech, Inc.).
  - 2. "Ram Tough 250-DM" (The Barrett Co.).
  - 3. "790-11 (Reinforced)" (Henry Company)





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4. "CCW-500R (Reinforced)" (Carlisle Coatings & Waterproofing).
- B. Elastomeric Flashing: Uncured neoprene, red lead curative, nonstaining, 60 mils (1.5mm) thick minimum, in longest lengths manufactured; one of the following as approved by the waterproofing manufacturer:
1. "Flex-Flash UN" (American Hydrotech, Inc.).
  2. "Ram-Flash 327 HRD (uncured)" (The Barrett Co.).
  3. "Neoflash" (Henry Company).
  4. "CCW-Uncured Neoprene Flashing" (Carlisle Coatings & Waterproofing).
- C. Reinforcing Sheet: Continuous filament needle-punched spun bond polyester bonded with an acrylic binder and as recommended by the hot fluid-applied rubberized asphalt waterproofing membrane manufacturer.
- D. Flashing Termination Bar: Waterproofing membrane manufacturer approved, pre-drilled, extruded aluminum, stainless steel or flexible, weather and UV resistant plastic with splayed top to receive sealant bead; longest lengths available.
- E. Flashing Pipe and Vent Clamping Rings: Waterproofing membrane manufacturer approved, stainless steel adjustable wormgear pipe and vent clamping rings; size appropriate to installation.
- F. Adhesives, Thinners, Primers, Sealers, Tape, Sealant and Solvents: Type as recommended by the manufacturer of the hot fluid-applied rubberized asphalt waterproofing.
- G. Protection Sheet: Manufacturer approved continuous strand glass fibers bonded with glass resinous binder and coated with weathering grade asphalt.
- H. Protection Board: Manufacturer approved, premolded, 1/8 in. (3mm) thick, semi-rigid board complying with ASTM D6506 Type 2 Class B consisting of mineral stabilized core sandwiched between layers of asphalt saturated felt, surface coated with asphalt and sealed to core under heat and pressure and provide with polyethylene film facings.
- I. Nonwoven-Geotextile-Faced, Molded-Sheet Drainage Panel: Manufactured composite subsurface drainage panels consisting of a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding No. 70 (0.21mm) sieve laminated to 1 side and a polymeric film bonded to the other side of a 3-dimensional, non-biodegradable, molded-plastic-sheet drainage core, with a vertical flow rate of 9 to 15 gpm/ft. (112 to 188 L/min./m).
- J. Root Barrier: Rubberized asphalt, polyester-reinforced sheet with a granular surfacing, specially formulated with a factory-applied root growth regulator. "Hydroflex RB II" (American Hydrotech, Inc.) or equal.
- K. Root Growth Regulator: Weather and UV-resistant; spray-applied. "SpinOut" (American Hydrotech, Inc.) or equal.



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**PART 3 - EXECUTION**

**3.1 GENERAL**

- A. Manufacturer's Instructions: Prepare substrates, apply primers and install the work of this Section, including equipment, components, and accessories in accordance with the manufacturer's instructions, except where more stringent requirements are shown or specified, and where project conditions require extra precautions or provisions to ensure satisfactory performance of the Work.

**3.2 EXAMINATION**

- A. Verification of Conditions: Examine the areas to receive the Work and the conditions under which the Work would be performed. Remedy conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.
- B. Manufacturer's Representation: The manufacturer of the hot fluid-applied rubberized asphalt waterproofing membrane and the applicator shall inspect the first pour of concrete substrate to review the acceptability of the concrete for application of the waterproofing membrane system.
- C. Verify that curing compounds or surface hardeners incompatible with hot fluid-applied rubberized asphalt waterproofing system have not been used on concrete surfaces.

**3.3 PREPARATION**

- A. Substrate Acceptability: Commencement of installation shall constitute acceptance of substrate conditions by the Installer.
- B. Cleaning and Patching of Substrate: Clean substrate of debris and deleterious material which would impair the Work. Patch cracks, voids and honeycombs to provide a smooth, structurally sound surface. Cut off high spots and grind smooth. Apply surface conditioners as recommended.
- C. Piping, Conduit And Other Penetrations: Do not proceed with membrane waterproofing until drains, piping, conduit, vents, ducts and other projections through the substrate have been installed. Holes, honeycombs and cavities shall be pointed or filled and finished flush.
- D. Preparation of Cracks and Joints: Prepare, treat, rout, and fill joints and cracks in substrate according to waterproofing manufacturer's written instructions and to recommendations in ASTM C898. Before coating surfaces, remove dust and dirt from joints and cracks according to ASTM D4258.

**3.4 INSTALLATION, VEGETATED PLANTER WATERPROOFING**

- A. Drainage: Surfaces to receive vegetated planter waterproofing system shall be sloped towards drains a minimum of 2%.
- B. Priming: Prime substrate surfaces. Use products and methods recommended by the waterproofing materials manufacturer. Treat non-moving cracks, penetrations, control joints and other joints in substrate with materials, methods and designs as recommended by the waterproofing membrane manufacturer.



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- C. Elastomeric Flashing: Where drains occur, apply membrane only after flashing around drains is in place. Lap flashing into the membrane in accordance with manufacturer's recommendations and instructions.
- D. Fluid-Applied Membrane: Install first layer of fluid-applied membrane to 90 mil thickness. Utilize methods recommended by the roofing membrane manufacturer. Apply additional material to correct areas deficient in thickness by procedures recommended by the membrane manufacturer.
- E. Reinforcing Sheet: Cover fluid-applied membrane with reinforcing sheet. Overlap edges a minimum of 3 inches. Brush in with a soft broom.
- F. Fluid-Applied Membrane: Install an additional fluid-applied membrane layer to 125 mil thickness.
- G. Root Barrier: Roll out and embed root barrier into fluid-applied membrane while the membrane is still warm and aggressively tacky. Wet-lap or torch weld adjacent sheets with a minimum of 3 inches overlap. Apply root growth regulator to all lapped edges per manufacturer's instructions.
- H. Drainage Mat: Cut mat to sizes of planters, in largest sizes possible to minimize joints, and to provide complete coverage over root barrier. Install mats with filter fabric face up and fold excess fabric under the core at perimeter edges. Start installation at bottom of slope, extending upslope so that fabric overlap from subsequent mats shingles down over previous mats.

**3.5 FIELD QUALITY CONTROL**

- A. Contractor's Quality Control Responsibilities: Contractor is solely responsible for quality control of the Work.

**3.6 ADJUSTING**

- A. Correct deficiencies in or remove fluid applied protected membrane waterproofing system components that do not comply with requirements. Repair substrates, and repair or reinstall components or system to a condition free of damage and deterioration at time of Substantial Completion and in compliance with warranty requirements.

**3.7 PROTECTION**

- A. Protection of Adjacent Construction: Protect adjacent construction for damage resulting from spillage, dripping and dropping of material. Prevent materials from entering and clogging drains and water conductors. Repair and restore, or replace other work which is soiled or damaged in connection with the performance of this work.
- B. Until waterproofing membrane is protected with insulation, protection board or the ballast system, keep areas free from traffic and other trades. Upon completion of waterproofing, provide necessary temporary protection to prevent damage. Upon completion of waterproofing, provide necessary temporary protection to prevent damage.

**END OF SECTION**

**SECTION 07 23 00  
BUILDING INSULATION**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. General: Provide building insulation in accordance with requirements of the Contract Documents.
- B. Related Work Specified Elsewhere:
  - 1. Section 01 81 13 "Sustainable Design Requirements" for additional references, definitions, documentation requirements, action plans, meetings, and performance requirements of products and systems.
  - 2. Installation of cavity wall insulation for exterior masonry cavity walls is specified in Section 04 20 00 "Unit Masonry".
  - 3. Roof insulation as part of roofing construction is specified in Section 07 52 00 "Modified Bituminous Membrane Roofing"
  - 4. Roof insulation as part of roofing construction is specified in Section 07 54 00 "Thermoplastic Membrane Roofing".
  - 5. Roof insulation as part of roofing construction is specified in Section 07 55 66 "Fluid Applied Protected Membrane Roofing"
  - 6. Curtain wall insulation for exterior curtain walls is specified in Section 08 44 00 "Curtain Wall Components".
  - 7. Acoustical insulation in partitions is specified in Section 09 21 17 "Gypsum Board Systems".
  - 8. Mechanical equipment, piping and ductwork insulations are specified in Division 21, 22 and 23 specification sections.

**1.2 SYSTEM DESCRIPTION**

- A. Performance Requirements
  - 1. Fire Resistive Rating: Identify materials with appropriate markings of applicable testing and inspecting agency.
    - a. Where materials are required by law or are specified to have a fire resistive rating, provide materials, accessories and application procedures which have been listed by UL or tested according to ASTM E814/UL 1479 to achieve the rating required.
    - b. Surface-Burning Characteristics: ASTM E84. Where specified or required provide the following maximum flame spread and smoke developed ratings when materials are tested in accordance with ASTM E84:
      - 1) Unfaced material will have a maximum flame spread and smoke-

developed of 0.

- 2) Faced material will have maximum flame spread and smoke-developed of 25 and 0 respectively.
- c. Combustibility: Glass, slag-wool-fiber/rock-wool-fiber insulations shall be rated as non combustible as defined by NFPA standard 220 when tested in accordance with ASTM E136.
2. Fungi Resistance: Blanket and/or Batt Insulation and facing shall be fungi resistant when tested in accordance with ASTM C1338 "Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings".
3. Plenum Rating: Provide glass, slag-wool-fiber/rock-wool-fiber insulation where indicated in ceiling plenums whose test performance is rated as follows for use in plenums as determined by testing identical products per "Erosion Test" and "Mold Growth and Humidity Test" described in UL 181, or on comparable tests from another standard acceptable to authorities having jurisdiction.
  - a. Erosion Test Results: Insulation shows no visible evidence of cracking, flaking, peeling, or delamination of interior surface of duct assembly, after testing for 4 hours at 2500 fpm (13 m/s) air velocity.
  - b. Mold Growth and Humidity Test Results: Insulation shows no evidence of mold growth, delamination, or other deterioration due to the effects of high humidity, after inoculation with Chaetomium globosum on all surfaces and storing for 60 days at 100% relative humidity in the dark.
  - c. Unfaced fiberglass batt insulation shall not be used above suspended ceilings. If used in plenums and shafts, fiberglass batt insulation must be encapsulated and formaldehyde-free. Fiberglass board products used in plenums shafts or for insulating ductwork must be wrapped or enclosed.

### **1.3 SUBMITTALS**

- A. Product Data: Submit for Architect's action. Submit manufacturer's technical literature specifications, and installation instructions describing the general properties of each material and accessory to be used in the Work.
- C. Quality Control Submittals: Submit for Architect's information.
  1. Manufacturer's Qualifications: Evidence that the specified materials have been manufactured by the same source and successfully utilized for a minimum of 5 years on projects of a similar scope to that shown and specified for this Project.

### **1.4 QUALITY ASSURANCE**

- A. Single-Source Responsibility: Obtain each type of building insulation from a single source with resources to provide products complying with requirements indicated without delaying the Work.
- B. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction.

Obtain necessary approvals from authorities having jurisdiction.

### **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Packing, Shipping, Handling, and Unloading: Deliver insulation materials in manufacturer's unopened containers or packages, fully identified with trade name, type, class, and other identifying information.
- B. Storage and Protection: Store above grade and protect from weather and damage. Do not allow insulation to become wet, soiled, or covered with ice or snow. Protect insulation from exposure to high temperatures, excessive exposure to sunlight, and contact with hot surfaces in excess of the safe temperature indicated by the manufacturer
- C. Extruded Polystyrene Insulation Exposure: Prohibit exposure of extruded polystyrene board insulation to sunlight except to extent necessary for period of installation and concealment. Protect against ignition at all times.

### **1.6 WARRANTY**

- A. General: Warranties and guaranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and are in addition to and run concurrent with other warranties and guaranties made by the Contractor under requirements of the Contract Documents.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. INS-01 – Not Used
- B. INS-02 – Not Used
- C. INS-03 - High Density Extruded Polystyrene Board Insulation: Rigid, closed-cell extruded polystyrene with integral high density skin complying with ASTM C578, Type VI, minimum compressive strength of 40 psi (275kPa), minimum R-Value of 5.0/in. at 75°F. (24°C); manufacturer's standard sizes; thickness as shown; with channeled edges; one of the following:
  - 1. "Styrofoam RoofMate" (The Dow Chemical Co.).
  - 2. "Foamular 400 XPS" (Owens-Corning Corp.).
  - 3. "CertiFoam 40" (DiversiFoam Products).
  - 4. "GreenGuard Insulation Board" (Pactiv Building Products).
- D. INS-04 – Not Used
  - 1. "Styrofoam PlazaMate" (The Dow Chemical Co.).
  - 2. "Foamular 604" (Owens-Corning Corp.).

3. "CertiFoam Plaza Deck" (DiversiFoam Products).
- E. INS-05 – Not Used
- F. INS-06 – Not Used
- G. INS-07 – Foil Faced Batt Insulation: Thermal insulation produced by combining either glass fibers or rock wool with thermosetting resins and containing a reflective vapor-retarder membrane facing on one surface; complying with ASTM C665, Type III, Class A; flame spread of 25 or less; minimum R-Value of 11 for 3-1/2 in. (89mm) thick at 75 F°. (24°C); manufacturer's standard sizes; thickness shown. one of the following:
  1. "Fire Safety FS-25" (Thermafiber Inc.).
  2. "Thermal FSK 25 Faced Batts" (Certaiteed).
  3. "FSK-25 Faced Batts" (Johns Manville).
- H. INS-08 - Unfaced Batt Insulation: Thermal insulation produced by combining either glass fibers or rock wool with thermosetting resins; complying with ASTM C665, Type I, Class A; flame spread of 25 or less; minimum R-Value of 11 for 3-1/2 in. (88mm) thick at 75°F. (24°C); manufacturer's standard sizes; thickness shown.
  1. "Fire Safety FS-15"(Thermafiber Inc.).
  2. "CertaPro AcoustaTherm Batts" (Certaiteed).
  3. "Unfaced Batts" (Johns Manville).
- I. INS-09 – Not Used
- J. INS-10 – Firestopping/Safing Insulation: Moisture-resistant, noncorrosive, non-deteriorating, mildew-proof and vermin-proof, specifically produced to provide fire containment between floors filling the void between slab edge and curtain wall insulation utilizing mineral fibers combined with thermosetting resins; complying with ASTM C612, Class 1 and 2; density 4 lbs/ft.<sup>3</sup> (64kg/m<sup>3</sup>); rated non combustible per Standard NFPA 220 when tested in accordance with ASTM E136; complete with assembly tested non-water soluble smoke seal topping; manufacturer's standard size; one of the following:
  1. "SAF Thermafiber Safing" (Thermafiber Inc.).
  2. "FBX Safing" (Fibrex, Inc.).
  3. "MinWool-1200 Safing" (IIG Minwool LLC).
  4. "SAFE" (Roxul Inc.).
- K. INS-11 – White Acoustical Insulation
  1. Select Sound White Acoustic Board (Owens Corning) 1" thick or approved eq.

## **2.2 ACCESSORIES**

- A. Adhesive for Bonding Insulation: Type recommended by insulation manufacturer and having fire resistance characteristics similar to that of the insulation.
- B. Sealer and Tape: Type recommended by insulation manufacturer and having perm rating and fire resistance characteristics similar to that of the insulation.
- C. Adhesively Attached Mechanical Fasteners: Zinc coated steel or nylon fasteners consisting of a perforated plate and prongs or spindles and self-locking washer; length to suit depth of insulation shown; Where spindles will be exposed to human contact after installation, protect ends with capped self-locking washers; Provide one of the following:
  - 1. "Tactoo Insul-Hangers" (AGM Industries, Inc.).
  - 2. "Insulation Hangers" (Gemco).
- D. Insulation Standoff: Spacer fabricated from galvanized mild-steel sheet for fitting over spindle of insulation anchor to maintain air space between face of insulation and substrate to which anchor is attached. Provide the following:
  - 1. "Clutch Clip" (Gemco) or approved equal.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Verification of Conditions: Examine the areas to receive the Work and the conditions under which the Work would be performed. Remedy conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

### **3.2 INSTALLATION**

- A. Extent of Insulation: Extend insulation full thickness over entire area to be insulated. Install in single layer unless otherwise shown or recommended by manufacturer. Cut and fit insulation tightly around obstructions and against each other. Neatly finish insulation exposed to view without broken corners or open joints.
- B. Installation over Waterproofing: Lay rigid insulation over waterproofing with beveled edges down and with slightly open joints. Seal edges of other board insulation with sealer to form a tight seal between units.
- C. Installation on Overhead Surfaces: Apply insulation to overhead surfaces with mechanical fasteners. Apply other insulation mechanical fasteners as recommended by the manufacturer. When mechanical fasteners are used, cut pins 1/8 in. (3mm) beyond face of board and apply self-locking cap after coating around pin with sealer.
  - 1. Installation on Concrete and Masonry Overhead Surfaces: Install board insulation on concrete and masonry substrates by mechanically attached, spindle-type insulation anchors according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation



type, thickness, and application indicated. If shown apply insulation standoffs to each spindle to create cavity width indicated between concrete substrate and insulation. Install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation below indicated thickness. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.

- D. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
- E. Installation Of Vapor Retarders: Place vapor retarders on side of construction indicated on Drawings. Extend vapor retarders to extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives or other anchorage system as indicated. Extend vapor retarders to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.
  - 1. Seal vertical joints in vapor retarders over framing by lapping no fewer than two studs.
  - 2. Before installing vapor retarders, apply urethane sealant to flanges of metal framing including runner tracks, metal studs, and framing around door and window openings. Seal overlapping joints in vapor retarders with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Seal butt joints with vapor-retarder tape. Locate all joints over framing members or other solid substrates.
  - 3. Firmly attach vapor retarders to metal framing and solid substrates with vapor-retarder fasteners as recommended by vapor-retarder manufacturer.
- F. Maintenance of Vapor Barrier: Maintain integrity of vapor barriers of insulation by taping and sealing joints, ruptures and edges of units adjoining other surfaces. Seal joints caused by pipes, conduits, electrical boxes and similar items penetrating vapor barriers to create an air-tight seal between penetrating objects and vapor barrier. Repair any tears or punctures in vapor retarders immediately before concealment by other work. Cover with tape or another layer of vapor barrier.
- G. Metal Furring Strips: Apply furring members to rigid insulation at 24 in. (61cm) on center. Use fasteners recommended by the furring strip manufacturer. Coordinate with the gypsum drywall applicator for location and spacing of furring strips, detailing of internal and external corners, openings and other areas of special consideration.

### **3.3 PROTECTION**

- A. General: Protect installed insulation, vapor barriers and accessories from harmful weather exposures and from possible physical abuse. Replace insulation damaged or unsuitable for use.

**END OF SECTION**

**SECTION 07 25 00  
WEATHER BARRIERS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. General: Provide weather barriers in accordance with requirements of the Contract Documents.
- B. Related Work Specified Elsewhere
  - 1. Section 01 81 13 "Sustainable Design Requirements" for additional references, definitions, documentation requirements, action plans, meetings, and performance requirements of products and systems.

**1.2 REFERENCES**

- A. General: Comply with the applicable provisions of the referenced standards except as modified by governing codes and the Contract Documents. Where a recommendation or suggestion occurs in the referenced standards, they shall be considered mandatory. In the event of conflict between referenced standards, this specification or within themselves, the more stringent standard or requirement shall govern.
- A. National Roofing Contractor's Association (NRCA): NRCA Roofing and Waterproofing Manual.

**1.3 SUBMITTALS**

- A. Product Data: Submit for Architect's action. Submit manufacturer's technical literature, specifications and installation instructions describing the general properties of each material and accessory to be used in the Work.
- B. Quality Control Submittals: Submit for Architect's information.
  - 1. Certificates:
    - a. Document Review: Before commencing work, submit a written statement signed by the Contractor and the Installer/Applicator certifying that the Contract Documents, shop drawings and product data have been reviewed with material manufacturers' qualified technical representatives and that they agree the selected materials are proper, compatible with contiguous materials and adequate for the application shown.
  - 2. Installer/Applicator's Qualifications: Evidence of successful completion of work of similar scope to that shown and specified for this Project.
  - 3. Manufacturer's Qualifications: Evidence that the specified materials have been manufactured by the same source and successfully utilized for a minimum of 5 years on projects of a similar scope to that shown and specified for this Project.



## **SECTION 07 25 00 WEATHER BARRIERS**

## **DIVISION 07**

### **1.4 QUALITY ASSURANCE**

- A. Qualified Installer/Applicator: The weather barrier work shall be performed by an Installer/Applicator having 5 years experience in the installation of specified materials on comparable projects and shall have the approval of the weather barrier manufacturer.
- B. Single-Source Responsibility: Obtain weather barrier system from one source of a single manufacturer. Obtain accessory products used in conjunction with weather barrier from the weather barrier manufacturer or from sources acceptable to the weather barrier manufacturer.
- C. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from authorities having jurisdiction.

### **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Packing, Shipping, Handling, and Unloading: Deliver materials in manufacturer's unopened containers identified with name, brand, type, and other qualifying information.
- B. Storage and Protection: Store materials in a dry location, to prevent damage or intrusion of foreign matter.

### **1.6 PROJECT/SITE CONDITIONS**

- A. Weather Conditions: Proceed with weather barrier and associated work only when weather conditions will permit unrestricted use of materials and adequate quality control of work being installed, in compliance with requirements and with recommendations of primary materials manufacturers.

### **1.7 WARRANTY**

- A. General: Warranties and guaranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and are in addition to and run concurrent with other warranties and guaranties made by the Contractor under requirements of the Contract Documents.
- B. Special Warranty: Provide a written warranty, signed by the Contractor, Installer and Manufacturer, for a 5-year period, against leaks or other failures resulting from defects of materials or workmanship. Upon notification of defects, within the warranty period, make the necessary removals, repairs and replacements, at the convenience of the Owner.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Weather Barrier (WB-1): Air and Vapor Barrier Sheet Applied Membrane.
  - 1. 40 mil (1 mm) thick, self-adhesive, modified bitumen sheet membrane with polyethylene face. 400 psi (2.8 MPa) minimum tensile strength in accordance with ASTM D412, 200% elongation in accordance with ASTM D412. Provide one of the following:
    - a. "CCW – 705" (Carlisle)

- b. "Perm-a-Barrier" (Grace Construction Co.)
  - c. "Blueskin SA" (Henry/Monsey/Bakor)
- 2. Flashing: Membrane for use in conjunction with the weather barrier. Flashing systems shall be a 40 mil (1 mm) thick, self-adhesive modified bitumen sheet membrane with polyethylene facer. This membrane shall be used to bridge joints, flash corners, transitions, and dissimilar materials, as through wall flashing, and other similar situations.
  - a. "CCW-705 TWF" (Carlisle)
  - b. "Perm-a-Barrier Wall Flashing" (Grace Construction Co.)
  - c. "Blueskin SA TWF" (Henry/Monsey/Bakor)

## **2.2 ACCESSORIES**

- A. Primers, Surface Conditioners, Mastics, Cleaners, Internal and External Angles and Flashings: As recommended by the membrane manufacturer for the purpose intended and compatible with membrane, and with the materials to which it is bonded.

## **PART 3 - EXECUTION**

### **3.1 GENERAL**

- A. Manufacturer's Instructions: Prepare substrates, apply primers and install the work of this Section, including components, and accessories in accordance with the manufacturer's instructions, except where more stringent requirements are shown or specified, and where project conditions require extra precautions or provisions to ensure satisfactory performance of the Work.

### **3.2 EXAMINATION**

- A. Verification of Conditions: Examine the areas to receive the Work and the conditions under which the Work would be performed. Remedy conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.
- B. Verify that curing compounds or surface hardeners incompatible with weather barrier have not been used on substrate surfaces.

### **3.3 PREPARATION**

- A. Substrate Acceptability Commencement of installation shall constitute acceptance of substrate conditions by the Installer.
- B. Cleaning of Substrate: Clean substrate of debris and deleterious material which would impair the Work. Patch cracks, voids and honeycombs to provide a smooth, structurally sound surface. Cut off high spots and grind smooth.



## **SECTION 07 25 00 WEATHER BARRIERS**

## **DIVISION 07**

### **3.4 INSTALLATION**

- A. Services Of The Manufacturer: At the start of the installation and periodically as work progresses provide the services of the manufacturer's technical representative at the job site as often as deemed necessary by the manufacturer to advise on phases of this work.
- B. Priming, Cleaning and Treatment of Joints. Prime substrate surfaces. Remove dust and dirt from joints and cracks according to ASTM D4258. Treat non-moving cracks, penetrations, control joints and other joints in substrate.
- C. Flashing: Install flashing as shown or required, properly lapped and adhered in place. Flash pipes, conduits, sleeves, and other projections passing through weather barrier and provide tight construction throughout. Use prefabricated boots or field-fabricated boots, fitted coverings, and other accessories as required. Lap flashing into the weather barrier.

### **3.5 PROTECTION**

- A. General: Protect weather barrier from damage during construction period so that it will be without indication of abuse or damage at time of acceptance. Protect the building and adjacent construction from damage resulting from spillage, dripping and dropping of materials. Repair and restore other work damaged during weather barrier operations.

**END OF SECTION**

**SECTION 07 54 00  
THERMOPLASTIC MEMBRANE ROOFING**

**PART 1 - GENERAL**

**1.00 SUMMARY**

Install a glass fiber reinforced adhered thermoplastic PVC roofing system including membrane, flashings and other components.

**A. Section Includes**

The work includes but is not limited to the installation of:

1. Selective removal of Existing Roofing
2. Substrate Preparation
3. Adhesive For Insulation and Cover Board
4. Polyisocyanurate (ISO) Rigid Insulation Flat and Tapered if repair is needed
5. Approved Gypsum Roof Cover Board
6. Water Based Adhesive for Membrane Attachment
7. Glass Fiber Reinforced 60 mils PVC Roof Membrane
8. PVC Clad Edge Metal and Fasteners
9. Low VOC Contact Adhesive for Flashings
10. 60 mils Glass Fiber Reinforced Asphalt Resistant PVC Flashing Membrane
11. Liquid Applied Reinforced Flashings
12. Other Metal Flashings
13. Sealants

**B. Upon successful completion of work the following warranties will be obtained:**

1. Manufacturer's Warranty
2. Roofing Applicator Warranty

**1.01 SUBMITTALS**

- A. Copy of the ASTM Certification for the named flashing product showing Type II Class I fiberglass reinforced membranes.
- B. Samples of each primary component to be used in the roof system and the manufacturer's current literature for each component.
- C. Sample copy of Manufacturer's warranty.
- D. Manufacturer's ISO 14001 certificate.
- E. Copy of Manufacturer's Platinum level NSF/ANSI 347 Sustainability Assessment certificate
- F. Copy of Manufacturer's UL recycled content certificate
- G. Material Safety Data Sheets (SDS)
- H. Letter from proposed Roofing Manufacturer indicating the actual polymer thickness of the product supplied for this project is 72 mils.



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- I. Written confirmation from the proposed Roofing Manufacturer stating the number of years it has directly manufactured the roof system under the trade names and/or trademarks as proposed.

**1.02 QUALITY ASSURANCE**

- A. Use only manufacturers systems certified Platinum by NSF/ANSI 347 Sustainability Assessment for Single Ply Roofing Membranes.
- B. Roofing membrane must be UL Certified to contain a minimum of 10% recycled content.
- C. Verify that the roofing system is manufactured directly by roofing system provider/supplier with the current formulation in use for past 20 years minimum to match the duration of the warranty.
- D. Unreinforced or polyester reinforced membrane base flashings are prohibited.
- E. No "Private Label", re sold, or third-party manufactured membranes are approved alternates.
- F. Qualifications of Roofer: The Roofing Contractor must be authorized by Manufacturer 5 years prior to bid.
- G. No deviation from the Project Specification or the approved shop drawings is permitted without prior written approval by the Owner, the Architect.
- H. Only Applicator personnel trained and authorized by manufacturer are permitted to complete work pertaining to the installation of Sarnafil membrane and flashings.
- I. Verify the roof deck and roof construction is structurally sound to provide support for the new roof system.
- J. The Manufacturer must provide interim and final roof inspection from a directly employed dedicated team of experienced inspectors. Sales personnel may not be used for on-site inspection of installations
- K. All base flashings and penetrations must have a minimum 8-inch height above the finished roof assembly. Care must be taken to ensure this is possible when installing equipment pads and making allowances for associated crickets.

**1.03 REGULATORY REQUIREMENTS**

These requirements are minimum standards do no roofing work without written documentation of the system's compliance, as required in the "Submittals" section of this specification.

- A. Field and Flashing membranes shall conform to ASTM D4434 (latest version), "Standard for Polyvinyl Chloride Sheet Roofing". Classification: Type II Grade I.
- B. Underwriters Laboratories, Inc. - Northbrook, IL  
  
Class A assembly
- C. California Title 24 Part 6: Roof membrane (not post installation applied finish) must comply with current minimum 3-year aged solar reflectance and minimum thermal emittance values

**1.04 PRE-INSTALLATION MEETING**

- A. Preinstallation Roofing Conference: Conduct conference at Project site.
  - 1. Meet with Architect, roofing Installer, and roofing system manufacturer's representative.



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2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.
10. Review field testing procedures, as applicable, after roofing installation.

**1.05 DELIVERY, STORAGE AND HANDLING**

- A. Accept only products delivered to the job site in the original unopened containers or wrappings bearing all seals and approvals.
- B. Handle all materials to prevent damage. Place all materials on pallets and fully protect from moisture.
- C. Store Membrane rolls lying down on pallets and fully protected from the weather with clean canvas tarpaulins. Unvented polyethylene tarpaulins are not accepted.
- D. Store all adhesives at temperatures between 40° F and 80° F.
- E. Store flammable materials in a cool dry area away from sparks and open flames. Follow precautions outlined on containers or supplied by material manufacturer/supplier.
- F. Remove all damaged materials from the job site.
- G. Load materials on the rooftop in such a manner to eliminate risk of deck overload due to concentrated weight.

**1.06 PROJECT CONDITIONS**

- A. Schedule and execute all work without exposing the interior building areas to the effects of inclement weather.
- B. Secure all new and temporary construction, including equipment and accessories, to preclude wind blow-off and roof or equipment damage.
- C. Install uninterrupted waterstops at the end of each day's work. Completely remove before proceeding.
- D. Prior to and during application, remove all excessive moisture, dirt, debris and dust.
- E. Immediately take all existing and new roofing, insulation, flashings and metal work removed during construction to a legal dumping area authorized to receive such materials.
- F. Verify that all roof drain lines are functioning correctly (not clogged or blocked) before starting work. Report any such blockages in writing to the Owner as appropriate for corrective action prior to the installation of the roof system.
- G. Inspect the substrate for defects such as excessive surface roughness, contamination, structural





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inadequacy, or any other condition that will adversely affect the quality of work. Stop work if any contamination or unusual or concealed condition is discovered and immediately notify the Owner of such condition in writing for correction.

- H. If any water is allowed to enter under the newly completed roofing, remove wet and damaged materials, provide new.

**1.07 SEQUENCING**

- A. Arrange work sequence to avoid use of newly constructed roofing as a walking surface or for equipment movement and storage. Where such access is absolutely required, provide all necessary protection and barriers to segregate the work area and to prevent damage to adjacent areas. Provide a substantial protection layer consisting of plywood over Sarnafelt or plywood over insulation board for all roof areas that receive concentrated rooftop traffic during construction.

**1.08 WARRANTY**

Upon successful completion of work, the following warranties must be provided:

1. 20 Year Full System Warranty
2. 2 Year Roofing Contractor Warranty

- B. Manufacturers System Warranty

Provide a "No Dollar Limit" non-prorated warranty that does not exclude ponding or standing water or contain time limits for standing water. No additional fees or roofing manufacturer inspections will be required to maintain the warranty. The System Warranty includes membrane, insulation, coverboard and attachment components of the roofing system provided by the Manufacturer.

- C. Applicator/Roofing Contractor Warranty

Provide a separate workmanship warranty. In the event any work related to roofing, flashing, or metal is found to be within the Applicator warranty term, defective or otherwise not in accordance with the Contract Documents, the Applicator shall repair that defect at no cost to the Owner. The Applicator's warranty obligation shall run directly to the Owner and be copied to the Manufacturer.

**PART 2 - PRODUCTS**

**2.01 MANUFACTURERS**

- A. PVC Thermoplastic Membrane Roofing: The components of the PVC membrane roof system are to be products by Sika Sarnafil Canton, Massachusetts as basis of design; local contact (562) 676-0459.

1. Sika Sarnafil G410 Minimum thickness 72 mils or approved equal.

- B. Private label and third-party-manufactured membranes are not permitted.

- C. Polymer Thickness

1. Membrane manufacturer is to certify that the polymer thickness is within 2 mils of the polymer thickness specified. Certification is to be signed by the membrane manufacturer's quality control manager.
2. Compliance with ASTM +/- 10% tolerance for membrane thickness is not sufficient or acceptable.



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**2.02 MATERIALS**

- A. PVC fiberglass reinforced membrane with a lacquer coating.
- B. Membrane shall conform to ASTM D4434 (latest version), "Standard for Polyvinyl Chloride Sheet Roofing". Classification: Type II, Grade I.
  - 1. Field Sheet –Sika Sarnafil G410-15, 60 mils minimum thickness. Color T24 compliant White (Basis of Design)
  - 2. Flashing Membranes – Sika Sarnafil G459 60mils thickness asphalt resistant membrane with fiberglass reinforcement. Standard Color.
- C. Polymer Thickness
  - 1. Membrane manufacturer is to confirm that the field sheet has the specified minimum polymer thickness with at least 35 mils above the reinforcement scrim. ASTM +/- tolerance for membrane thickness is not accepted.

**2.03 INSULATION/COVER BOARD**

- A. Where damaged replace substrate with uniform Thickness Polyisocyanurate with felt facer complying with ASTM C1289 Type II, Class 1 Grade 2 (20 PSI).  
  
Provide thickness to match existing.
- B. Sarnatherm tapered.
- C. Tapered rigid Polyisocyanurate foam with felt facer complying with ASTM C1289 Type II, Class 1 Grade 2 (20 PSI).  
  
Tapered insulation to provide ¼ inch per foot finish slope. Cricket valleys slope should be maximized but are not expected to achieve the major ¼ inch per foot slope.
- D. Cover Board: 1/2 in. Dens Deck Prime manufactured by Georgia-Pacific, 1/2 in. Fiberglass Mat Faced Gypsum Roof Board.
- E. Provide only fire-tested, Fiberglass Mat Faced Gypsum Roof Board with EONIC™ Technology for improved moisture resistance.



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1. Tested to exceed ASTM C473 with only 1-gram maximum surface moisture absorption and 5% total moisture absorption by weight.
2. Acceptable Product: GP Gypsum, Dens Deck Prime ® Roof Boards.
3. Thickness: 1/2 inch.
4. Width: 4 feet.
5. Length: 8 feet
6. Surfacing: Primed Fiberglass Mat.
7. Flexural Strength, Parallel (ASTM C473): 40 lbf, minimum.
8. Permeance (ASTM E96): Greater than 30 perms.
9. Compressive Strength (Applicable Sections of ASTM C472): Nominal 900 pounds per square inch.
10. Flame Spread/ Smoke Development (ASTM E84): Not more than 0 Flame Spread, 0 Smoke Development
11. Combustibility (ASTM E136): Noncombustible
12. Fire resistance rating (UL 790 and ASTM E108): Class A
13. Mold Resistance (ASTM D3273): Scored a 10

**2.04 COMPONENTS**

- A. Sarnaclad PVC Laminated Metal
- B. Sarnareglet - A heavy-duty, extruded aluminum flashing termination reglet used at walls and large curbs.
- C. Universal PVC Prefabricated stack - A prefabricated vent pipe flashing made from 0.060-inch thickness PVC.
- D. Prefabricated Corners - Prefabricated outside and inside flashing corners made of 0.060-inch-thick PVC.

**2.05 ATTACHMENT COMPONENTS**

- A. Membrane Adhesives

Sarnacol 2121 Adhesive

A water-based adhesive used to attach the membrane to horizontal or near-horizontal substrates. Consult Product Data Sheets for additional information.

- B. Flashing Adhesive

Stabond U148A Adhesive

A low VOC reactivating-type adhesive used to attach membrane to flashing substrate.

- C. Peelstop

An extruded aluminum, low profile bar used with certain fasteners to attach to the roof deck or to walls/curbs at terminations, penetrations and at incline changes of the substrate.

- D. Insulation Board Adhesive

One step low-rise polyurethane foam used to attach insulation to approved compatible substrates. Adhesive is applied with a gravity fed applicator or by hand with a dual component caulk gun in bands 12 in. on center. Additional adhesive may be required for rougher surfaces. Consult Product Data Sheets for additional information.



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**2.06 SEALANTS**

- A. Multi-Purpose Sealant (for termination details). Sika 1A or approved equal.
- B. Approved two-component urethane adhesive sealant.
- C. Depending on substrates, the following sealants are options for temporary overnight tie-ins:
  - 1. Spray-applied, water-resistant urethane foam.
  - 2. Mechanical attachment with rigid bars and compressed sealant.

**2.07 WALKWAY PROTECTION**

- A. Sarnatred V

Polyester reinforced, 0.096-inch, weldable membrane with surface embossment. Used as a protection layer. Sarnatred is supplied in rolls of 39.3 inches wide and 50 feet long.

**2.08 LIQUID FLASHING APPLIED MEMBRANE FLASHING SYSTEM (LAM)**

- A. Fluid-Applied Membrane System, 20 Year Warranty: Sikalastic RoofPro 20 with Sika Reemat Premium:
  - 1. Primer: Sikalastic EP Primer
  - 2. Base Layer: Sikalastic 641 Lo-VOC, 50 mils wet film thickness, 32 sf/gal coverage rate approx.
  - 3. Reinforcing Layer: Reemat Premium.
  - 4. Top Layer: Sikalastic 641 Lo-VOC, 30 mils wet film thickness; 53 sf/gal coverage rate approx.
  - 5. Sealant for fillet bead applications and membrane penetrations shall be Sikaflex® 11FC by Sika Corp.
  - 6. Supplemental reinforcement shall be Sika Flexitape Heavy by Sika Corp.

**2.09 MISCELLANEOUS FASTENERS AND ANCHORS**

- A. Provide only post-galvanized steel, aluminum or stainless-steel fasteners. Take precautions to avoid galvanic corrosion. Install expansion type fasteners with stainless steel pins for the attachment of metal to masonry. The minimum embedment for all concrete fasteners and anchors is 1¼ inch and for all miscellaneous wood fasteners and anchors used for flashings 1 inch.

**PART 3 - EXECUTION**

**3.01 PREPARATION**

- A. Prior to commencing work verify compatibility of specified system with installed system. Notify the Architect in writing of discrepancies.
- B. Where removed, dispose of all existing roof systems, down to the underlying substrate, including all flashings and sheet metal accessories.
- C. Inspect roof deck and repair as necessary with material matching the existing thickness and complying with current building codes.
- D. Verify that all roof drain lines are functioning correctly (not clogged or blocked) before starting work. Report any such blockages in writing to the Architect as appropriate for corrective action prior to the installation of the new roof system.
- E. Inspect the roof and interior of the building notifying the owner of any areas where fastener penetrations may affect existing electrical or plumbing systems.



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- F. Identify and remove obsolete roof top equipment/vents/sleepers.
- G. Review low curb heights with the manufacturer's representative. Existing vents to remain in place must have at least 8 inches flashing height. If in doubt consult manufacturer for guidance and acceptance for warranty. Provide new vents where required.
- H. Remove and dispose of the existing coping metal, base flashing, deteriorated wood blocking and metal flashings necessitated by equipment removal..
- I. Clean excessive contamination from existing penetrations to receive new roofing and allow satisfactory sealing of stack flashings.
- J. Remove only that amount of roofing and flashing which can be made weathertight with new materials before the onset of inclement weather. If any water is allowed to enter under the newly completed roofing, remove and replace the affected roof boards with new dry materials.
- K. Remove HVAC equipment and associated curbs to allow new curbs and roofing to be placed. Avoid attaching the equipment into the platform, if restraints are required attach them into the sides of the curbs only. Apply RoofPro 641 to waterproofing the equipment platforms where appropriate and comprehensively seal the fasteners with Sikaflex 1A sealant.
- L. Coordinate all aspects of demolition work with Architect.
- M. Provide protective measures in and around the building as required prior to beginning roofing demolition work.
- N. Prior to tear-off, verify that all soil pipes, flues, steel members, and other similar penetrations within area of modification are secured to the building structure. Coordinate removal or securement of all unsecured penetrations prior to the start of roof demolition.
- O. Remove all debris from the existing roof and broom clean prior to beginning new roof system application. Remove debris from roof area and properly dispose of all materials off site.
- P. At the end of demolition work, ensure that all drains are in proper working order and that drain lines are totally unrestricted. Implement any required corrective measures before leaving the job site that day.

**3.02 INSULATION AND COVERBOARD INSTALLATION**

- A. Where damaged, install insulation and coverboard according to insulation manufacturer's instructions and shop drawings.
- B. Neatly cut Insulation and Coverboard to fit around penetrations and projections.
- C. Install tapered insulation around drains creating a drain sump.
- D. Cover all insulation board and coverboard with Sarnafil membrane by the end of the day or before the onset of inclement weather.
- E. Use at least 2 layers of insulation when the total insulation thickness exceeds 2-1/2 inches. Stagger joints at least 12 inches between layers.
- F. Insulation boards are to rest evenly on the roof deck avoiding air spaces between the boards and the substrate. Install each board tightly against the adjacent boards on all sides.
- G. All layers are to be adhered using low rise foam.
- H. Adhered Boards: Install Coverboard using low rise polyurethane adhesive.



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1. Apply using gravity fed applicator or by hand with a dual component caulk gun over properly prepared existing metal deck in bands 12 inches on center in the field area of the roof, 6 inches on center in the perimeter area of the roof, and 4 inches on center in the corner area of the roof. Bands are 1/4-1/2 in. wide before foaming. Adhesive will within 30-45 seconds at 60-80°F transform from a liquid into low rise foam. Immediately set insulation boards into wet adhesive.
2. On roof slopes greater than 1/2 inch in 12 inches begin adhering insulation at low point and work upward to avoid slippage. Designate one person walk in, trim/slit and apply weight to all insulation boards to ensure adequate securement.
3. For multiple layers of insulation apply adhesive over the base layer. When fully secured repeat the above procedures above for attachment of each insulation layer and coverboard.

**3.03 INSTALLATION OF MEMBRANE**

- A. Remove broken, delaminated, wet or damaged insulation boards and provide new.
- B. Sarnacol 2121 Adhesive (or approved equal)
  1. Pour adhesive out of the pail and spread using notched 1/4 inch x 1/4 inch x 1/4 inch rubber squeegees. Apply the 2121 adhesive at a rate of 1 1/2 gallons/100 square feet. No adhesive is applied to the back of the membrane or to seam areas.
  2. Unroll the PVC membrane immediately into the wet adhesive. Adjacent rolls overlap previous rolls by 3 inches. This process is repeated throughout the roof area. Immediately after application into adhesive, press each roll firmly into place with a water-filled, foam-covered lawn roller by frequent rolling in two directions. Do not allow adhesive to skin-over or surface-dry prior to installation of membrane.
  3. In addition to adhering, mechanically fasten roof membrane securely at terminations, penetrations, and perimeter of roofing.
  4. Apply roof membrane with side laps shingled with slope of roof deck where possible.

**3.04 HOT-AIR WELDING OF SEAM OVERLAPS**

- A. General
  1. Hot air weld all seams in accordance with Manufacturer requirements.
  2. Weld only clean and dry membrane.
  3. Clean seam areas, overlap roofing, and hot-air weld side and end laps of roof membrane and sheet flashings to ensure a watertight seam installation.
  4. Test lap edges with probe (rounded screwdriver) to verify seam weld continuity.
  5. Verify field strength of seams. Take a minimum of three, one-inch-wide, cross-section samples of welded seams daily. Repair seam sample areas.
  6. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.

**3.05 MEMBRANE FLASHINGS**

- A. Install flashings concurrently with the roof membrane as the job progresses.
- B. Adhere flashing materials to compatible surfaces only. Use caution to ensure adhesive fumes are not drawn into the building.



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- C. Apply adhesive in smooth, even coats with no gaps, globs or similar inconsistencies. Press the bonded sheet firmly in place with a hand roller. Do not apply adhesive in seam areas. Apply membrane panels uniformly.
- D. Install peelstop bar according to the Detail Drawings with approved fasteners into the parapet or the structural deck at the base of parapets, walls and curbs.
- E. The minimum flashing height is 8 inches above finished roofing level unless otherwise accepted in writing.
- F. Mechanically fasten all flashing membranes along the counter-flashed top edge with Peelstop/Reglet or approved alternate at 6-8 inches on center.
- G. Additionally, secure all adhered flashings that exceed 30 inches in height. Sheet metal backing is required behind gypsum sheathing to accommodate the required 12-inch fastener spacing. Consult Manufacturers Technical Department for securement methods.

**3.06 PVC CLAD FLASHINGS/EDGE METAL**

- A. Form and install PVC clad metal flashings as described in the Detail Drawings.
  - 1. Fasten all metal flashings into approved substrates solid wood nailers with two rows of approved fasteners 4" on center staggered.
  - 2. Install metal to provide adequate resistance to bending and allow for normal thermal expansion and contraction.
- B. Space adjacent sheets of PVC clad metal 1/4 inch apart. Cover the joint with 2-inch-wide aluminum tape. Hot air weld a 4-inch minimum wide strip of Sarnafil flashing membrane over the joint.

**3.07 LIQUID APPLIED FLASHING SYSTEM (LAM)**

- A. Install liquid applied flashing membrane system at irregular and non-standard penetrations and substrates only.
  - 1. Mix and apply the specified primer per the instructions on the technical data sheet.
  - 2. Allow to cure and dry in accordance with manufacturer's technical data sheet.
  - 3. For all horizontal-to-vertical transitions, provide a 3/4" x 3/4" Sikaflex polyurethane sealant cant.
  - 4. Apply a minimum of a 3-inch wide strip of Joint Tape SA or Sika Flexitape Heavy.
  - 5. Install liquid applied flashing resin and reinforcement per manufacturer's written instructions.

**3.08 WALKWAY INSTALLATION**

- A. Verify the lap welds to be covered are continuous and the membrane is clean and dry before installing walkway. Apply a continuous coat of adhesive to the deck sheet and the back of the walkway and press walkway into place with a water-filled, foam-covered lawn roller. Hot-air weld the overlaps and the perimeter

**3.09 TEMPORARY CUT-OFF**

Construct all temporary waterstops to provide a 100% watertight seal. Maintain the stagger of insulation joints by installing partial panels of insulation. Carry the new membrane into the waterstop. Seal the waterstop to the deck and/or substrate so that water will not be allowed to travel under the new or existing



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roofing. Seal the edge of the membrane in a continuous heavy application of sealant. Cut out all contaminated membrane before resuming work.

**3.10 FIELD QUALITY CONTROL**

- A. Quality Control of Welded Seams - Check all welded seams for continuity using a rounded screwdriver. Visible evidence that welding is proceeding correctly is smoke during the welding operation, shiny membrane surfaces, and an uninterrupted flow of dark grey material from the underside of the top membrane.
- B. On-site evaluation of welded seams shall be made daily at locations as directed by the Architect or Manufacturer's representative. Take one inch wide cross-section samples of welded seams at least three times a day. Correct welds display failure from shearing of the membrane prior to separation of the weld. Each test cut shall be patched by the Applicator at no extra cost to the Owner.
- C. Install the new roof system in such a manner as to maintain watertight integrity on a daily basis. If water is allowed under the completed roof remove the roofing and dispose of all wet and damaged insulation and coverboards. Provide and reinstate new dry roofing materials once the roof deck has been allowed to dry.
- D. Interim and Final Inspections - Upon completion of the installation and the delivery to Manufacturer by the Applicator of a certification that all work has been done in strict accordance with the contract specifications and Manufacturer's requirements, a warranty inspection shall be made by the manufacturers Specialist Technical Representative no personnel with a sales role/function within the company shall be permitted to inspect contractors work. Water test all drains to confirm they are functioning properly after roofing work is completed. Correct any blockages and restore drain operation

**3.11 COMPLETION**

Correct all punch-list items to the satisfaction of the Architect and Manufacturer prior to demobilization.

**3.12 DEMONSTRATION**

- A. Provide maintenance documents and personal instruction for the facilities staff and other interested parties at a single pre-determined mutually convenient time. The instruction shall include the following topics:
  - Access restriction and precautions
  - Avoiding Mechanical Damage
  - Potential Contaminants and rectification
  - Cleaning
  - Emergency repairs
  - Procedures for permanent repairs and alterations

**END OF SECTION**



**SECTION 07 62 00  
SHEET METAL FLASHING AND TRIM**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. General: Provide sheet metal flashing and trim in accordance with requirements of the Contract Documents.
- B. Related Work Specified Elsewhere:
  - 1. Section 01 81 13 "Sustainable Design Requirements" for additional references, definitions, documentation requirements, action plans, meetings, and performance requirements of products and systems.
  - 2. Wood grounds, nailers, blocking, cants and other wood items required for complete roof installation is specified under Section 06 10 00 "Rough Carpentry".
  - 3. Single ply roofing system is specified in Section 07 54 00 "Thermoplastic Membrane Roofing".
  - 4. Sealants and joint fillers are specified under Section 07 92 00 "Joint Sealants".
  - 5. Counterflashing of mechanical and electrical equipment items penetrating roofing or waterproofing systems is specified in Division 24 and Division 26 specification sections.

**1.2 REFERENCES**

- A. General: Comply with the applicable provisions of the referenced standards except as modified by governing codes and the Contract Documents. Where a recommendation or suggestion occurs in the referenced standards, such recommendation or suggestion shall be considered mandatory. In the event of conflict between referenced standards, this specification or within themselves, the more stringent standard or requirement shall govern.
- B. Copper Development Association (CDA)
  - 1. "Contemporary Copper"
  - 2. Publication No. 120/2 "Welding, Soldering, Brazing and Surfacing of Copper and Copper Alloys".
- C. National Association of Architectural Metal Manufacturers (NAAMM): "Metal Finishes Manual".
- D. Sheet Metal and Air Conditioning Contractors National Association (SMACNA): "Architectural Sheet Metal Manual".
- E. Specialty Steel Industry of North America (SSINA): "Designer Handbook: Standard Practices for Stainless Steel Roofing, Flashing, and Copings".



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**1.3 SUBMITTALS**

- A. Product Data: Submit for Architect's action. Submit manufacturer's technical literature, specifications and installation instructions describing the general properties of each material and accessory to be used in the Work.
- B. Quality Control Submittals: Submit for Architect's information.
  - 1. Installer's Qualifications: Evidence of successful completion of work of similar scope to that shown and specified for this Project.

**1.4 QUALITY ASSURANCE**

- A. Qualified Installer: The sheet metal flashing and trim work shall be performed by an installer having 5 years experience in the installation of materials specified on comparable projects.
- B. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from authorities having jurisdiction.

**1.5 DELIVERY, STORAGE AND HANDLING**

- A. General: Deliver and store materials in manufacturer's original packaging labeled to show name, brand, type, and grade. Store materials in protected dry location off ground in accordance with manufacturer's instructions. Do not open packaging nor remove labels until time for installation.

**1.6 PROJECT/SITE CONDITIONS**

- A. Weather Conditions: Do not proceed with the Work during inclement weather nor when weather forecasts are unfavorable, unless the Work will proceed in accordance with the manufacturer's requirements and instructions.

**1.7 WARRANTY**

- A. General: Warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and are in addition to and run concurrent with other warranties-made by the Contractor under requirements of the Contract Documents.
- B. Special Warranty: Provide a written warranty, directly to the Owner, for a period of 5 years, warranting against leaks resulting from defects of materials or quality of work. Upon notification of such defects, within the warranty period, make the necessary repairs and replacements at the convenience of the Owner.

**PART 2 - PRODUCTS**

**2.1 SHEET METAL MATERIALS**

- A. Sheet Metal Materials
  - 1. Stainless Steel Sheet Flashing (Type FL-01): ASTM A666, Type 316 dead soft fully annealed except where harder temper required for forming or performance;



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0.015 in. (0.34 mm) thick (28 gage) unless otherwise shown or specified, finish No. 2D.

- B. Prefabricated Flashing System: The flashing closure system is specified herein by proprietary designation prefabricated flashings for column, pipe and other penetrants as manufactured by SBC Industries and establish the quality standards required for these systems. Equivalent products of other manufacturers will be considered provided they meet those established standards. Fabricated from 26 gauge (0.5mm) stainless steel type 316, with 2B finish, complying with ASTM A240, and in strict compliance with manufacturer's fabrication requirements.

1. Pipe Flashings: Provide fabrications as follows:

- a. Fabrication of flashings for pipes, conduits and other round items penetrating, resting on or anchored to roof which allows a tubular flashing to be slipped over.
  - 1) Form tubular flashing sleeve no less than 9 in. (225mm) high and of proper diameter to provide min. 1/8 in. (3.1 mm) and max. 1/4 in. (6.3 mm) clearance form pipe or conduit.
  - 2) Fabricate square flashing plate to a size 7-1/2 in. (109.5mm) larger than protrusion. Punch hole of appropriate size in center and extrude surrounding material upward 1/4 in. (6.3mm) providing a continuous vertical soldering flange and solder 9 in. (228mm) high tubular flashing sleeve. Cut 1 in. (25mm) min. radius on flashing plate corners.
  - 3) Fabricate counter flashing 5 in. (125mm) high with a diameter 1/2 in. (12.7mm) to 2 in. (50mm) larger.
  - 4) Shop solder seams watertight.
- b. Fabrication of flashings for connected pipes, conduits and other round items not allowing a tubular flashing to be slipped over.
  - 1) Form semi-cylindrical tubular flashing sleeves (180 degree) not less than 9 in. (228mm) high, tightly seam intersecting halves to mate snugly. Provide a split flashing plate with radial corners and being formed upward to provide a continuous soldering flange for semi-cylindrical sleeve engagement. Size each unit to allow for vibration and thermal movement of pipe or conduit with 1/8 in. (3mm) minimum by 1/4 in. (6mm) maximum.
  - 2) Form cylindrical counter flashing 5 inches (127mm) high with seamed edge to a diameter 1/4 in. (6mm) larger than 9 in. (225mm) high sleeve.
  - 3) Provide conical sealant cover, sloped outward and downward at 30 degrees to 45 degrees from a horizontal plane, with an inside diameter equal to pipe or conduit size and an outside diameter 2 in. (50mm) larger.



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- c. Systems
  - 1) Large Pipes: Either "PL/D 2 Piece Divided System" or "PL/S 1 Piece Slip-On System" (SBC Industries).
  - 2) Small Pipes: Either "CD-PD 2 Piece Divided System" or "CS-PS 1 Piece Slip-On System" (SBC Industries).
- 2. Column, Angles, Channels, Square Tubing and Beam Flashings: Provide fabrications as follows:
  - a. Form a 6 in. (150mm) high two piece angular configuration similar to penetration but allowing 3/16 in. (5mm) min. to 3/8 in. (9mm) max. clearance in any direction. Fabricate flashing flanges in two pieces and shop solder to 6 in. (150mm) angular stacks. Provide an umbrella type counter flashing conforming to protrusion. Extend 3/4 in. (19mm) at 45 degree outward from angular stack flashing.
  - b. Systems
    - 1) "AA/D, H/D, CH/D, SQ/D" (SBC Industries).
- 3. Custom Shapes: Provide custom shaped flashings for penetrants as shown or required formed to shape of penetrating elements, and counter flashed as required by manufacturer's specifications, recommendation and instructions to provide a water-proof, air tight system.
- C. Surface Applied Reglets: Stainless steel Type 316; 0.018 in. (0.46mm) thick; complete with factory punched slots, factory fabricated reglet corners, cap/counter flashing, sealant flange, neoprene-steel washers and other required accessories. Provide one of the following:
  - 1. "SM Surface Mounted Reglet" (Fry Reglet Corp.).
  - 2. "Type D Reglet" (Cheney Flashing Company).
  - 3. "RC-1" (MM Systems).

**2.2 AUXILIARY MATERIALS**

- A. Solder for Stainless Steel: ASTM B32; provide 60% - 40% tin/lead solder, with acid-chloride type flux, except use rosin flux over tinned surfaces.
- C. Fasteners: Screws, rivets and nails shall be non-corrosive, of same material as sheet metal flashing and trim or compatible material. Match finish of exposed heads with material being fastened.
- D. Metal Accessories: Provide sheet metal clips, cleats, straps, anchoring devices, and similar accessory units as required for installation of work, matching or compatible with material being installed, noncorrosive, size and gage required for performance.
- E. Sealant: As specified in Section 07 92 00 "Joint Sealants".



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- F. Foam Tape: ASTM D-1056; closed cell foam, PSA on one side, 1/4 in. (6mm) or 3/8 in. (9mm) x 1 in. (25mm) wide.
- G. Epoxy Seam Sealer: 2-part noncorrosive metal seam cementing compound, recommended by metal manufacturer for exterior/interior nonmoving joints including riveted joints.
- H. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, non-drying, nonmigrating sealant.
- I. Paper Slip Sheet: 5-lb. (2.3kg) rosin-sized building paper.
- J. Polyethylene Underlayment: Minimum 6-mil (0.15mm) carbonated polyethylene film resistant to decay when tested in accordance with ASTM E154.
- K. Dielectric Separator: Cold applied, asphalt emulsion type complying with ASTM D1187, non-sagging, resistant to severe corrosion conditions; applied in two coats for an overall minimum dry film thickness of 25 mils (365µm) or heavy coating of epoxy paint in minimum 2.0 mil (60 µm) dry film thickness.

**2.3 FABRICATION**

- A. General Metal Fabrication: Shop-fabricate work to greatest extent possible. Comply with details shown and with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other recognized industry practices. Fabricate for waterproof and weather-resistant performance, with expansion provisions for running work, sufficient to permanently prevent leakage, damage, or deterioration of the work. Form work to fit substrates. Comply with material manufacturer instructions and recommendations for forming material. Form exposed sheet metal flashing and trim work without excessive oil-canning, buckling, and tool marks, true to line and levels indicated, with exposed edges folded back to form hems.
- B. Seams: Fabricate nonmoving seams in sheet metal flashing and trim with flat-lock seams. For metal other than aluminum, tin edges to be seamed, form seams, and solder. Form aluminum seams with epoxy seam sealer; rivet joints for additional strength where required.
- C. Expansion Provisions: Where lapped or bayonet-type expansion provisions in work cannot be used or would not be sufficiently water/weatherproof, form expansion joints of intermeshing hooked flanges, not less than 1 in. (25mm) deep, filled with mastic sealant concealed within joints.
- D. Sealant Joints: Where movable, nonexpansion type joints are indicated or required for proper performance of work, form metal to provide for proper installation of elastomeric sealant, in compliance with SMACNA standards.
- E. Separations: Provide for separation of metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with dielectric coating or other permanent separation as recommended by manufacturer/fabricator.



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**PART 3 - EXECUTION**

**3.1 GENERAL**

- A. Manufacturer's Instructions: Prepare substrates, apply primers and install the work of this Section, including accessories in accordance with the manufacturer's instructions, except where more stringent requirements are shown or specified, and where project conditions require extra precautions or provisions to ensure satisfactory performance of the Work.

**3.2 EXAMINATION**

- A. Verification of Conditions: Examine the areas to receive the Work and the conditions under which the Work would be performed. Contractor shall remedy conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

**3.3 PREPARATION**

- A. Substrate Acceptability: Commencement of installation shall constitute acceptance of substrate conditions by the Installer.
- B. Cleaning of Substrate Clean surfaces of laitance, dust, dirt, oil, wax and other foreign materials.
- C. Piping, Conduit And Other Penetrations: Proceed with flashing work only after pipe sleeves, vents, curbs, inserts, drains, and other projections through the substrate to be flashed have been completed. Proceed only after concrete and masonry substrate defects, including honeycombs, voids, and cracks, have been repaired to provide a sound substrate free of forming materials, including reveal inserts.

**3.4 INSTALLATION**

- A. General: Install the materials in accordance with SMACNA standards, except where more stringent requirements are shown or specified. Conceal fasteners and joints wherever possible in exposed Work, and locate to prevent leakage. Maintain a water-tight installation at fasteners, joints and seams. In general, furnish metal flashings in 8 ft. (2.4m) lengths joined with flat locked soldered seams. Provide an expansion joint at not over 24 ft. (6.8m) on centers with a loose lock filled with sealant. Provide separation of dissimilar materials by coating or covering metal with inert material to prevent galvanic corrosion.
- B. Copper: Comply with applicable requirements and follow details and specifications illustrated in "Contemporary Copper" as published by the Copper Development Association.
- C. Stainless Steel: Follow guide specifications for "Stainless Steel Roofing, Flashing and Accessories" published by the International Nickel Company in their Architect's Stainless Steel Library, Volume 3.
- D. Temperature: Sheet metal flashing and trim shall be designed and detailed for a temperature of 70 deg. F. (21 deg. C.) at time of installation with allowance made for a 150 deg. F. (66 deg. C.) ambient temperature range. Make necessary adjustments for installations at other than design temperature.



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- E. Underlayment: Where stainless steel or aluminum is to be installed directly on cementitious or wood substrates, install a slip sheet of red rosin paper and a course of polyethylene underlayment.
- F. Reglets: Install reglets to receive counterflashing in manner and by methods shown as recommended. Where shown in concrete, furnish reglets to trades of concrete work for installation as work of Division 3 sections. Where shown in masonry, furnish reglets to trades of masonry work, for installation as work of Division 4 sections. Install counterflashing in reglets, either by snap-in seal arrangement or by welding in place for anchorage and filling reglet with elastomeric sealant.
- G. Metal Through-Wall Flashing: Provide continuous through-wall flashing, lap-seamed and soldered at splices and intersections, complete with preformed corners and end dams. Cover and seal Work as required for a minimum of 4 in. (100 mm) embedment.
- H. Cap and/or Counter Flashing: Where cap and/or counter flashing is required as component of accessory or elsewhere shown, install to provide adequate waterproof overlap with roofing or roof flashing (as counter-flashing) or separately as its own component. Seal with thick bead of mastic sealant, except where overlap is indicated to be left open for ventilation.
- I. Expansion Joint Installation: Nail flanges of expansion joint units to curb nailers, at maximum spacing of 6 in. (150mm) o.c. Fabricate seams at joints between units with minimum 3 in. (75mm) overlap, to form a continuous, waterproof system. .
- J. Prefabricated Flashing System: Install prefabricated flashing system complete with base sleeves, cap flashing, tape, sealant, solder, fasteners and accessories , as shown, and as required for a waterproof, airtight installation.

**3.5 CLEANING**

- A. Upon completion of Work, clean the exposed surfaces to make neat and obtain uniform appearance.

**3.6 PROTECTION**

- A. Protect the Work during the remainder of the construction period, so that there will be no indication of deterioration or damage at the time of acceptance by the Owner.

**END OF SECTION**

**SECTION 07 84 00  
FIRESTOPPING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. General: Provide Firestopping in accordance with requirements of the Contract Documents.
- B. Related Work Specified Elsewhere:
  - 1. Section 01 81 13 "Sustainable Design Requirements" for additional references, definitions, documentation requirements, action plans, meetings, and performance requirements of products and systems.
  - 2. Openings Through Floors and Walls
    - a. Fire Rated: Metal sleeves for fire rated openings through floors and walls shall be provided under applicable mechanical, electrical, plumbing and fire protection specifications sections.
    - b. Non-Rated: Non-rated openings through floors and walls shall be sealed under applicable mechanical and electrical specification sections.

**1.2 REFERENCES**

- A. General: Comply with the applicable provisions of the referenced standards except as modified by governing codes and the contract documents. Where a recommendation or suggestion occurs in the referenced standards, they shall be considered mandatory. In the event of conflict between referenced standards, this specification or within themselves, the more stringent standard or requirement shall govern.
- B. ASTM International (ASTM):
  - 1. ASTM E84, "Standard Test Method for Surface Burning Characteristics of Building Materials".
  - 2. ASTM E119, "Standard Test Methods for Fire Tests of Building Construction and Materials".
  - 3. ASTM E814, "Standard Test Method for Fire Tests of Through-Penetration Fire Stops".
  - 4. ASTM E1399, "Standard Test Method for Cyclic Movement and Measuring the Minimum and Maximum Joint Widths of Architectural Joint Systems".
  - 5. ASTM E1725, "Standard Test Methods for Fire Tests of Fire-Resistive Barrier Systems for Electrical System Components".
  - 6. ASTM E1966, "Standard Test Method for Fire-Resistive Joint Systems".
  - 7. ASTM E2174, "Standard Practice for On-Site Inspection of Installed Fire Stops".
  - 8. ASTM E2307, "Standard Test Method for Determining Fire Resistance of Perimeter Fire Barrier Systems Using Intermediate-Scale, Multi-Story Test Apparatus".



9. ASTM E2837 "Standard Test Method for Determining the Fire Resistance of Continuity Head-of-Wall Joint Systems Installed Between Rated Wall Assemblies and Nonrated Horizontal Assemblies".
- C. Factory Mutual Research (FM): FM 4991, "Approval of Firestop Contractors".
- D. International Firestop Council (IFC): "Recommended IFC Guidelines for Evaluating Firestop Systems Engineering Judgments".
- E. National Fire Protection Association (NFPA): NFPA 285, "Standard Method of Test for the Evaluation of Flammability Characteristics of Exterior Non-Load Bearing Wall Assemblies Containing Combustible Components Using the Intermediate-Scale, Multi-Story Test Apparatus".
- F. Underwriters Laboratories Inc. (UL):
  1. UL "Fire Resistance Directory".
  2. ANSI/UL 263, "Standard for Fire Tests of Building Construction and Materials".
  3. ANSI/UL 723, "Standard Test for Surface Burning Characteristics of Building Materials".
  4. ANSI/UL 1479, "Standard for Fire Tests of Through-Penetration Firestops".
  5. ANSI/UL 2079, "Standard for Tests for Fire Resistance of Building Joint Systems".

### **1.3 SYSTEM DESCRIPTION**

- A. Performance Requirements: Provide firestop materials and systems produced, tested and installed to resist the spread of fire and the passage of smoke and gases through openings in fire rated assemblies, including floor and wall construction classified in accordance with ANSI/UL 263 (ASTM E119).
- B. Firestop System Tests and Ratings: Provide materials which have been tested and rated as systems applicable to each firestop condition in the Work, as listed by UL "Fire Resistance Directory" or by other qualified testing agency acceptable to the authorities having jurisdiction.
  1. Test methods are specified by reference to standards listed in the UL "Fire Resistance Directory", and also by reference to equivalent (ASTM) standards for use in comparison with ratings from other acceptable testing agencies. In the event of a discrepancy in methods or ratings, the provisions of UL standards shall apply.
- C. Leakage: Provide systems rated to function as an effective airtight seal preventing passage of smoke and gases in normal service as well as under exposure to heat and fire conditions. Do not use materials to function as air seals if such materials are known to shrink with curing or aging.
  1. Provide through-penetration and fire-resistive joint systems subjected to an air leakage test conducted in accordance with ANSI/UL1479 and/or ANSI/ UL2079 with published L-Ratings for ambient and elevated temperatures as evidence of the ability of the through-penetration or fire-resistive joint system to restrict the movement of smoke.

- D. Building Movement: Provide systems rated to withstand building movements, including thermal movements, loading deflections, shrinkage, creep and similar movements, when tested in accordance with the specified standards. In addition, provide firestopping sufficiently flexible to accommodate motion such as pipe vibration and water hammer without damage to the seal.
1. Provide fire-resistive joint sealants designed to accommodate a specific range of movement and tested for this purpose in accordance with a cyclic movement test criteria as outlined in ASTM E1399, ASTM E1966 or ANSI/ UL 2079.
- E. Compatibility: Provide only the firestop materials which are explicitly recommended by the manufacturer for the application, and which have been determined by tests to be totally compatible with the adjoining construction and each other, as stated in the manufacturer's published data or certified by the manufacturer for each application.
- F. Material Content: Provide firestop materials which are non-toxic, non-hazardous, do not contain asbestos fibers or dust particles nor other substance prohibited by law, and do not require hazardous waste disposal of used containers. Provide firestopping systems that upon curing, do not re-emulsify, dissolve, leach, breakdown or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water or other forms of moisture characteristic during and after construction.
- G. Coordination With Insulation Coverings: Provide firestopping which does not require the removal of insulation coverings integral to the penetrating item. Insulation coverings include thermal and acoustical insulations and their protective jackets and coverings and insulation/coverings for electrified components.
- H. Surface Burning Characteristics: Provide firestop materials rated not more than flame spread 25 and smoke developed 450, when tested in accordance with ANSI/UL 723 (ASTM E84).
- I. Water Resistance: Provide firestop systems resistant to degradation from moisture during normal service before exposure to heat and fire. Firestop systems used in the following locations shall also function as a watertight seal preventing passage of water.
1. Penetrations in exterior wall and roof construction.
  2. Floor penetrations in mechanical and electrical equipment rooms, janitorial rooms or closets, toilet and shower rooms, garage and loading dock areas, and rooms or spaces having a floor drain. Wall penetrations in such spaces where any portion of the firestop is 3 in. (75 mm) or less above the floor.
- J. Through-Penetration Firestop Systems: Provide systems tested in accordance with ANSI/UL 1479 (ASTM E814), under a positive pressure differential not less than 0.01 in. (2.5 Pa) water column, and classified with ratings for fire resistance, temperature rise, leakage, and movement capability to meet the specified requirements.
1. Flame Rating: For gypsum board construction, provide systems having an F rating equal to, but not greater than, the fire-resistive rating of the surrounding gypsum board construction. For non-gypsum board construction, provide systems having an F rating equal or greater than the fire-resistive rating of the surrounding construction, but not less than 1-hour.
  2. Temperature Rating: Provide systems having a T rating equal to the F rating, except where a T rating for the firestop condition is specifically exempted by the applicable code.

3. Water-Tight Rating: Provide systems having a W rating of Class 1 with resistance up to 3 ft. (1 m) of water pressure for firestopping at locations where a watertight seal is required.
- K. Firestop Joint Systems: Provide systems tested in accordance with ANSI/UL 2079 (ASTM E1966), under a positive pressure differential not less than 0.01 in. (2.5 Pa) water column, and classified with ratings for fire resistance, leakage, and movement capability to meet the specified requirements..
- L. Perimeter Fire Barriers: Provide systems tested in accordance with NFPA 285 and ANSI/UL 2079 (ASTM E2307 and E1966), under a positive pressure differential not less than 0.01 in. (2.5 Pa) water column, and classified with ratings for integrity, insulation, leakage, and movement capability to meet the specified requirements.
- M. Floor Penetrations: For floor penetrations with annular spaces exceeding 4 in. (100mm) or more in width and exposed to possible loading and traffic, provide firestop systems capable of supporting the floor loads involved either by installing floor plates or by other means
- N. Chase Walls: Penetrants passing through fire-resistance rated floor-ceiling assemblies contained within chase wall assemblies shall be protected with products tested by being fully exposed to the fire outside of the chase wall. Systems within the UL Fire Resistance Directory that meet this criterion are identified with the words "Chase Wall Optional".
- O. Accessories: Provide components for each firestopping system that are needed to install fill materials. Use only components specified by the firestopping manufacturer and approved by the qualified testing and inspecting agency for the designated fire-resistance-rated systems. Accessories include but are not limited to the following items:
  1. Permanent forming/damming/backing materials.
  2. Temporary forming materials.
  3. Substrate primers or bond breakers.
  4. Collars.
  5. Steel sleeves.
- P. Firestopping Exposed to View: For firestopping exposed to view, traffic, moisture, and physical damage, provide products that do not deteriorate when exposed to these conditions.

#### **1.4 SUBMITTALS**

- A. Combined Submittals for Firestop Systems: Combine the submittals required for every component part in the various firestop systems to be used in the Work. Show in the submittals that the firestop systems have received the prior approval of the Contractor, the single firm awarded the firestopping Work, and the manufacturer of each principal component.
- B. Product Data: Submit for Architect's action. Submit manufacturer's technical literature, specifications and installation instructions describing the general properties of each material and accessory to be used in the Work. Product Technical Data Sheets for each material component required as shown within the firestop system drawing(s) shall be included in the submittal.

- C. Shop Drawings: Submit for Architect's action. Furnish shop drawings or full size 8 ½ in. x 11 in. system drawings to include the information that is typically contained within a UL System Drawing for each type firestopping condition for the fabrication and installation of the Work. Include illustrations from a qualified testing and inspection agency, which are applicable to every firestop system and indicate configuration of the construction and penetrating item. Furnish the following information in the form stipulated by Architect.
1. Indicate for each firestopping condition the specific firestop system and construction assembly, including size and configuration of penetrations or voids, the thickness and attachment of materials, and the surrounding construction. Indicate the material, size and function of the penetrant. List the tested performance ratings of the firestop system for each specific application as well as fire resistance rating of the surrounding construction.
  2. Furnish a legend indicating location of each firestop system in the Work.
  3. Identify each specific firestop system with a type designation specific to the Project and include in location legend. Indicate corresponding testing agency and system identification with year of test.
  4. Identify each condition for which there is no tested and rated firestop system in existence, and furnish a certified design suitable for the condition as approved by the manufacturer's qualified Fire Protection Engineer. Use of an engineered deviation shall not be permitted if a tested and rated firestop system exists for the condition.
  5. Where Project conditions require modification of qualified testing and inspecting agency's illustration to suit a particular through-penetration or joint firestop condition, submit illustration drawing approved by firestopping manufacturer's fire protection engineer with all relevant information identified pertaining to modifications.
- D. Samples: Submit for Architect's action. Label samples to indicate product, characteristics, and location in the Work. Samples will be reviewed for color and appearance only. Furnish sufficient samples to establish the full range of colors and textures for materials exposed in the finished work. Compliance with other requirements is the responsibility of the Contractor. Provide the following:
1. Firestopping Material: Each type, cured, 6 in. (150mm) long.
  2. Damming Materials: 6 in. (150mm) sq. of each type.
  3. Metal Accessories: One representative sample.
- E. Quality Control Submittals: Submit for Architect's information.
1. Test Reports
    - a. Submit certified copies of test reports (conclusions and summary only) from approved independent testing laboratories showing compliance with the Contract Documents and including current system number per UL Listing for each type of firestop and penetration to be utilized on the project.
  2. Certifications: Submit the following:
    - a. Document Review: Before commencing work, submit a written

statement signed by the Contractor and the Installer/Applicator certifying that the Contract Documents, shop drawings and product data have been reviewed with material manufacturers' qualified technical representatives and that they agree the selected materials are proper, compatible with contiguous materials and adequate for the application shown

- b. Certificate(s) of Conformance: Submit "Certificate(s) of Conformance" from UL for each product/system showing that listed products/systems have been tested to the appropriate standards.
  - c. Installer/Applicator Statement: Statement from applicator of firestopping system(s) attesting to the fact that each system has been accepted by local governing agencies for each specific condition on Project and that materials were installed in accordance with the manufacturer's installation instructions and details.
  - d. Installer's Certification: Furnish evidence that the Installer is an approved firestop contractor, certified in accordance with FM 4991 requirements.
  - e. Manufacturer's Certification: Furnish certification signed by the primary manufacturer of the firestop materials, stipulating which firestop systems are proposed for use in the Work, and stating that the Installer is approved as an experienced applicator of said firestop systems.
  - f. System Test Reports: Furnish certified test reports from the testing agency performing the firestop system tests, indicating identification of the corresponding system design number, a test summary and a conclusion verifying compliance with specified requirements.
  - g. Engineered Deviations: Furnish certification from firestop systems manufacturer, identifying each condition for which there is no tested and rated firestop system in existence, and describing a suitable design for the condition as based on modification of a tested system and approved by the manufacturer's qualified Fire Protection Engineer. Engineered deviations will be reviewed in accordance with IFC recommended guidelines. Use of an engineered deviation from a manufacturer shall not be permitted if a tested and rated firestop system from another manufacturer exists for the condition.
- F. Closeout Submittals: Submit for Owner's documentation.
- 1. Special Warranty: As specified.
  - 2. Record Documents: Furnish record drawings annotated with the changes made during installation of the Work so as to be a complete set of "as installed" plans. Use shop drawings as basis to show changes. Accurately depict the entire firestop system and surrounding construction.

## **1.5 QUALITY ASSURANCE**

- A. Firestop Manufacturer: Do not use firestop material produced by any manufacturer who will not agree to send a direct employee as a qualified technical representative to the project site, during the initial installation and when requested, for the purpose of training appropriate installer personnel in proper selection and installation procedures and for rendering advice

concerning the proper installation of materials. Manufacturer shall employ a professional Fire Protection Engineer with qualifications acceptable to the Society of Fire Protection Engineers (SFPE).

- B. Firestop Systems: Provide only firestop systems which have been tested and listed as firestop systems to meet every condition in the Work. Do not provide materials or systems not part of a tested firestop system suitable for the condition or not certified by manufacturer as an engineered deviation suitable for the condition as approved by manufacturer's qualified Fire Protection Engineer. Use of an engineered deviation from a manufacturer shall not be permitted if a tested and rated firestop system from another manufacturer exists for the condition.
- C. Qualified Installer: The Installer shall be an approved firestop contractor, certified in accordance with FM 4991 requirements, trained and approved by the firestop system manufacturer in the use of the materials and equipment to be employed in the Work.
- D. Single Responsibility: Contract the firestopping Work to a single firm so as to establish undivided responsibility of the firestop systems for the entire Work.
- E. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from all such authorities.
- F. Field Samples: Provide a field sample for each type, condition, and application of firestopping in the building at final installation locations. Utilize the same materials and installation methods in the sample as required for the final Work. Schedule the installation with allowance for sufficient curing time so that the sample may be examined, and any necessary adjustments made, at least 1 week prior to date scheduled for commencing installation of the Work. When accepted, sample areas shall serve as the standard for materials, workmanship, and appearance for such Work throughout the project and shall remain a part of the final Work.
- G. Pre-Installation Meetings: Prior to installation of the building services and walls, Contractor shall meet with the various trades for such Work and the firestopping Installer to review installation clearances, framing around openings, minimum spacing of penetrants, correct opening sizes for penetrant systems to be used, penetrant materials permitted, the maximum number of penetrants in each opening, and access at both sides of penetrations for installation of firestopping.

#### **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. General: Deliver and store materials in manufacturer's original packaging labeled to show name, brand, type, and grade. Store materials in protected dry location off ground in accordance with manufacturer's instructions. Do not open packaging nor remove labels until time for installation.

#### **1.7 PROJECT / SITE CONDITIONS**

- A. Requirements: Do not proceed with the Work when project/site conditions are unfavorable, unless the Work will proceed in accordance with the manufacturer's requirements and instructions and any agreements or restrictions of the Pre-Construction Conference. Maintain adequate temperature and ventilation conditions to ensure proper application and curing of firestopping.

## **1.8 SEQUENCING**

- A. Coordination: Verify that construction and sizing of sleeves, openings, core-dilled holes, cut openings and penetrating items shall ensure that firestop systems can be installed according to specified requirements. Determine that installation of the penetrants shall not compromise the integrity of the elements being penetrated, that access and working clearances are adequate, and that the approved firestop systems can be properly installed. Coordinate the sequencing of Work to permit access at both sides of penetrations for installation of firestopping.
- B. Inspection: Notify the inspecting agency at least 7 days in advance of firestopping system installations. Confirm the dates and times on days preceding each series of installations. Do not cover or conceal firestopping system installations behind other construction until after each installation has been examined by the inspecting agency, and building inspector if required by authorities having jurisdiction.

## **1.9 WARRANTY**

- A. General: Warranties and guaranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and are in addition to and run concurrent with other warranties and guaranties made by the Contractor under requirements of the Contract Documents

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Acceptable Manufacturers: Firestop systems produced by the following manufacturers will be acceptable, subject to review by Architect. For each type of firestop system used throughout the Work, provide only firestop materials made or recommended by a single manufacturer.

Hilti Construction Chemicals Inc.	Isolatek International
3M	Specified Technologies Inc.
Tremco Inc.	United States Gypsum Co.
- B. Firestop Systems, Typical (Excludes Perimeter Fire Barriers): Provide only firestop systems which have been tested and listed as firestop systems to meet every condition in the Work. Do not provide materials or systems not part of a tested firestop system suitable for the condition or not certified by manufacturer as an engineered deviation suitable for the condition as approved by manufacturer's qualified Fire Protection Engineer. Use of an engineered deviation from a manufacturer shall not be permitted if a tested and rated firestop system from another manufacturer exists for the condition.
  - 1. Firestop systems indicated on the Drawings are based on design conditions. Contractor's selection of firestop systems shall be suitable for the field conditions, based on the actual size, location and materials used in the Work.
- C. Auxiliary Materials: Provide the miscellaneous accessory items necessary to complete each firestopping condition, including, but not limited to, temporary or permanent damming, backing or forming materials, fillers, mechanical fastenings, support devices, collars, sleeves, cleaners, primers and other materials, as made or recommended by the firestop material manufacturer and tested with the rated firestop system.



**PART 3 - EXECUTION**

**3.1 GENERAL**

- A. Manufacturer's Instructions: Prepare substrates and install the work of this section, including components, and accessories in accordance with the manufacturer's instructions, except where more stringent requirements are shown or specified, and where project conditions require extra precautions or provisions to ensure satisfactory performance of the work.

**3.2 EXAMINATION**

- A. Verification of Conditions: Examine the areas to receive the Work and the conditions under which the Work would be performed. Remedy conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.
  - 1. Do not apply firestop material until the construction defining the opening and installation of all penetrants through the opening has been completed. Verify that pipe, conduit, cable, and other penetrants have been secured.

**3.3 PREPARATION**

- A. Substrate Acceptability: Commencement of installation shall constitute acceptance of substrate conditions by the Installer
- B. Surface Preparation: Perform cleaning and surface preparation immediately prior to installation of firestopping. Prepare the substrate surfaces for proper adhesion of firestop materials and for compatibility of materials to be in contact. Clean substrates to remove coatings or other substances which might interfere with bond of firestop materials. Remove materials and substances from openings which are not part of the tested firestop system, unless otherwise recommended by manufacturer. Provide masking materials or use other precautions to prevent spillage or migration of firestop material onto adjoining surfaces.

**3.4 INSTALLATION**

- A. Firestopping Applications: Provide in accordance with the manufacturers' instructions and the accepted shop drawings. Apply materials to obtain complete filling to the correct depth and dimensions without gaps or voids. Remove excess material, except where overlapping onto adjoining construction is a normal part of the tested and recommended system. Provide firestopping for applications including, but not limited to, the following conditions.
  - 1. Multi-cable transit penetrations without conduit through fire rated construction.
  - 2. Joints or gaps within fire rated floor and wall construction, including fire rated floor-to-floor, wall-to-wall, and floor-to-wall conditions.
  - 3. Expansion joints in walls and floors.
  - 4. Gaps between the top of fire rated walls and floors, ceilings, or roof assemblies.
  - 5. Openings around structural members which penetrate floors or walls.
  - 6. Perimeter fire barrier for gaps between fire-rated floors and non-rated exterior walls.
- B. Engineered Deviations: Where field conditions deviate from tested system conditions or are not otherwise reflected on shop drawings and certified by manufacturer as an engineered



deviation, consult with manufacturer's technical representative to determine the proper system, and submit the proposed design before proceeding.

- C. Priming: Prime or seal substrates in accordance with the manufacturer's recommendations for proper adhesion in each application. Promptly remove any spillage and avoid migration of primer or surface sealer onto adjoining surfaces.
- D. Damming: Provide leakproof damming or containment to seal openings and otherwise prevent flow or displacement of firestopping from the spaces to be filled. Provide only non-combustible damming where the damming cannot be removed after application of firestopping. Combustible damming may be used temporarily, but only if damming is completely removed as soon as the firestopping is cured and self-supporting.
- E. Void Filler: Provide to seal gaps in noncombustible type damming materials and to seal around penetrants where the void filler is an integral part of the firestop system.
- F. Bundled and Touching Penetrants: Where penetrants are bundled together or contact each other in passing through the same opening, sufficiently separate each penetrant and completely encapsulate with firestopping to make a smoketight and airtight installation.
- G. Intumescent Materials at Fire Rated HVAC Duct Dampers: Do not use intumescent firestopping that could during intumescence cause stress or buckling of construction surrounding duct dampers and impair the damper operation.

### **3.5 FIELD QUALITY CONTROL**

- A. Manufacturer's Field Service: At the start of the installation, periodically as the Work progresses, and after completion, furnish the services of the firestop material manufacturers' technical representative at the job site as necessary to advise on every phase of the Work. As a minimum, furnish representative's attendance during the first day of installation for each major type of firestop material, and furnish technical assistance to the Installer as may be required.
- B. Inspections:
  - 1. Firestopping materials shall be inspected by the manufacturers' technical representative as required to assure proper mixing and application.
  - 2. Prior to concealing and enclosing an area containing firestopping, Contractor shall notify the inspection agency and also arrange for inspections by authorities having jurisdiction.
- C. Field Identification of Firestop Systems: Provide an identification tag at the location of each firestop system in fire walls, fire barriers, fire partitions, smoke barriers, and smoke partitions with a permanent label or marking to indicate the name of the installer, the date of installation, the name of manufacturer and firestop system, the name of testing agency and tested firestop system identification, and the words "Do Not Disturb - Fire Resistance Rated System" in lettering not less than 0.5 inches in height.
  - 1. Identification Tags: Provide the identification on metal tags attached with permanent fasteners, or on plastic tags with a self-adhesive that is suitable for the substrate and causes partial tag destruction if removal is attempted. Secure each tag in location suitable for inspection within 6 in. (150 mm) of the firestop system, and not more than 30ft. (15 m) intervals measured horizontally along the system length.

**3.6 OWNER'S MONITORING ACTIVITIES**

- A. Owner's Inspection Agency: An independent inspection agency, engaged at the Owner's expense, will perform the following activities to monitor the Contractor's Quality Control Program. The monitoring activities do not relieve the Contractor of sole responsibility for maintaining the Quality Control Program.
- B. Inspections: Provide in accordance with ASTM E2174 requirements and perform inspections as the work progresses. Verify that firestopping systems have been constructed in compliance with the submitted designs for fire rating required by the Contract Documents and are acceptable to authorities having jurisdiction.
  - 1. Visually inspect firestop materials and substrates before installation to ascertain that preparation has been performed in accordance with the Contract Documents.
  - 2. Inspect the completed Work, including removal of damming materials, if used, to ensure an adequate and complete fire and smoke seal.
  - 3. Perform final inspection after other trades have completed Work in contact with firestopping material, but before the firestop system is covered.

**3.7 ADJUSTING**

- A. Repair: Repair damaged firestopping or remove and replace if damaged beyond successful repair. Comply with manufacturer's recommendations for repair and replacement.

**3.8 CLEANING**

- A. Upon completion of the Work, remove unused materials, debris, containers and equipment from the project site.

**3.9 PROTECTION**

- A. Protect the Work during the construction period so that it will be without any indication of use or damage at the time of acceptance.

**END OF SECTION**

**SECTION 07 92 00  
JOINT SEALANTS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. General: Provide joint sealants in accordance with requirements of the Contract Documents.
- B. Related Work Specified Elsewhere:
  - 1. Section 01 81 13 "Sustainable Design Requirements" for additional references, definitions, documentation requirements, action plans, meetings, and performance requirements of products and systems.
  - 2. Masonry control and expansion joint fillers and gaskets for masonry is specified in Section 04 20 00 "Masonry Units"
  - 3. Sealing penetrations in fire rated construction is specified in Section 07 84 00 "Firestopping".
  - 4. Glazing sealants are specified in Section 08 80 00 "Glazing".
  - 5. Acoustical sealant for gypsum board construction is specified in Section 09 21 17 "Gypsum Board Systems".
  - 6. Sealant for sealing edge moldings at perimeter of acoustical ceilings is specified in Section 09 51 00 "Acoustical Ceilings".
  - 7. Expansion and isolation joint filler strips for joint fillers in concrete paving is specified in Section 32 13 13 "Concrete Paving".
  - 8. Sealing of electrical and mechanical work is specified under applicable Mechanical and Electrical specification sections.

**1.2 REFERENCES**

- A. General: Comply with the applicable provisions of the referenced standards except as modified by governing codes and the Contract Documents. Where a recommendation or suggestion occurs in the referenced standards, such recommendation or suggestion shall be considered mandatory. In the event of conflict between referenced standards, this specification or within themselves, the more stringent standard or requirement shall govern.
- B. ASTM International (ASTM):
  - 1. ASTM C1193 "Standard Guide for Use of Joint Sealants".
  - 2. ASTM C1401 "Standard Guide for Structural Sealant Glazing".
  - 3. ASTM C1330 "Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid- Applied Sealants".

4. ASTM C1087 "Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems".
  5. ASTM C1247 "Standard Test Method for Durability of Sealants Exposed to Continuous Immersions in Liquids".
- C. Glass Association of North America (GANA): "Sealant Manual".

### **1.3 SYSTEM DESCRIPTION**

A. Design Requirements

1. Exterior Joint Sealants: Provide exterior elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.
2. Interior Joint Sealants: Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.
3. Compatibility: Provide only the sealants and joint fillers which are explicitly recommended by the manufacturer for the application, and which have been determined by tests to be totally compatible with the joint surfaces and each other, as stated in the manufacturer's published data or certified by the manufacturer for each application.
4. Staining: Provide sealant systems which shall not cause or contribute to staining of substrate surfaces. Manufacturer shall perform staining tests of sealant systems in accordance with ASTM C510 and ASTM D2203 methods for each joint substrate condition in the Work.
5. Suitability for Immersion in Liquids: Where sealants are indicated for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.

### **1.4 SUBMITTALS**

- A. Product Data: Submit for Architect's action. Submit manufacturer's technical literature, specifications and installation instructions describing the general properties of each material and accessory to be used in the Work.
1. Statement that each product to be furnished is recommended for the application shown.
  2. Complete instructions for handling, storage, mixing, priming, installation, curing and protection of each type of sealant.
  3. Provide independent validation from the "Sealant Waterproofing and Restoration Institute" that the manufacturers of the weatherproofing sealants meet their claimed movement capability.
- B. Samples: Submit for Architect's action. Label samples to indicate product, characteristics, and location in the Work. Samples will be reviewed for color and



**SECTION 07 92 00  
JOINT SEALANTS**

**DIVISION 07**

appearance only. Furnish sufficient samples to establish the full range of colors and textures for materials exposed in the finished work. Compliance with other requirements is the responsibility of the Contractor. Submit the following:

1. Sealant Samples: 12 in. (300mm) long and installed between samples of the materials to be sealed for the Project complete with backer rods and fillers.
- C. Joint Sealant Schedule: Submit for Architect's action. 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.
- D. Quality Control Submittals: Submit the following for Architect's information:
1. Test Reports
    - a. Preconstruction Compatibility And Adhesion Testing: Submit results of preconstruction compatibility and adhesion testing as specified herein, indicating which joint sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on preconstruction testing including which substrates require priming and recommended primer type(s).
    - b. Preconstruction Stain Resistance Testing: Submit results of preconstruction stain resistance testing as specified herein, indicating which joint sealants and substrates combinations resulted in staining or other detrimental conditions. Along with test results, submit sealant manufacturer's letter stating agreement to provide warranty against staining.
    - c. Preconstruction Field Testing: Submit results and evaluations of preconstruction field testing as specified herein.
  2. Certificates
    - a. Document Review: Before commencing work, submit a written statement signed by the Contractor and the Installer/Applicator certifying that the Contract Documents, shop drawings and product data have been reviewed with material manufacturers' qualified technical representatives and that they agree the selected materials are proper, compatible with contiguous materials and adequate for the application shown.
    - b. Certification (in the form of standard data sheet or letter) that each type of compound and sealant to be furnished complies with these Specifications.
    - c. Certification that each type of sealant joint filler and sealant backer rod scheduled for use in structural silicone systems has been tested for

compatibility with selected sealant in accordance with ASTM C1087 and is recommended by the sealant manufacturer for the intended use.

3. Installer/Applicator's Qualifications: Evidence of successful completion of work of similar scope to that shown and specified for this Project.
4. Manufacturer's Qualifications: Evidence that the specified materials have been manufactured by the same source and successfully utilized for a minimum of 5 years on projects of a similar scope to that shown and specified for this Project.
- E. Closeout Submittals: Submit for Owner's documentation.
  1. Warranties: Special warranties as specified.

### **1.5 QUALITY ASSURANCE**

- A. Installer/Applicator: The sealant work shall be performed by an installer/applicator having 5 years experience in the installation of specified materials on comparable projects. The installer shall have the approval of the sealant materials manufacturer.
- B. Manufacturer's Representative: Do not use joint sealants until the manufacturer has a qualified representative at the project site at the start of the work to review conditions of application, verify joint width conditions and to ensure proper installation of his materials.
- C. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from such authorities.
- D. Field Samples: Prior to the Pre-Installation Meeting, provide a field sample for each type of joint sealer system in the building at areas to be designated by the Architect. Samples shall represent the primary types of materials, substrate surfaces, joint size, exposure, and other conditions to be encountered in the Work. Utilize the same materials and installation methods in the sample as required for the final Work. Schedule the installation with allowance for sufficient curing time so that the sample may be examined, and any necessary adjustments made, at least 1 week prior to date scheduled for commencing installation of the Work. When accepted, sample areas shall serve as the standard for materials, workmanship, and appearance for such Work throughout the project.
  1. Examination of Field Samples: As part of the Pre-Installation Meeting, visually examine the samples for staining, dirt pickup, shrinkage, color, general workmanship and appearance. Cut and pull the sealant from each sample joint, and examine for internal bubbles or voids, adhesion, and general compatibility with substrate
- E. Testing
  1. Preconstruction Compatibility and Adhesion Testing: Submit samples of materials that will contact or affect joint sealants to sealant manufacturers for compatibility and adhesion testing, as indicated below:
    - a. Use test methods standard with manufacturer to determine if priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates. Perform tests under conditions of 72 deg. F. (22 deg. C) temperature and 50% relative

humidity. Manufacturer(s) of sealant(s) shall submit written recommendations when installations involve adverse temperature or humidity conditions.

- b. Submit not less than 9 pieces of each type of material, including joint substrates, shims, joint sealant backings, secondary seals, and miscellaneous materials.
  - c. Schedule sufficient time for testing and analysis of results to prevent delay in the progress of the Work.
  - d. Investigate materials failing compatibility or adhesion tests and obtain sealant manufacturer's written recommendations for corrective measures, including use of specially formulated primers.
  - e. Testing will not be required when sealant manufacturer is able to submit joint preparation data required above which is acceptable to Architect and is based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.
2. Preconstruction Stain Resistance Testing: Prior to testing of mock-ups, submit fully identified samples of materials that will contact or affect joint sealants to sealant manufacturers, in sizes and quantities as required, for stain testing, as indicated below:
- a. Manufacturer shall perform staining tests of sealant systems in accordance with ASTM C510 and ASTM D2203 methods for each joint substrate condition in the Work. Submit quantities of each type of contiguous joint substrate material as required by referenced standard and in sizes as required by the sealant manufacturer for testing.
  - b. Schedule sufficient time for testing and analysis of results to prevent delay in the progress of the Work.
3. Preconstruction Field Testing: Prior to installation of joint sealants, field-test their adhesion to joint substrates as follows:
- a. Locate test joints where indicated or, if not indicated, as directed by Architect.
  - b. Conduct field tests for each type of exterior elastomeric sealant and joint substrate application.
  - c. Arrange for tests to take place with the Contactor, the Architect and the sealant manufacturer's technical representative present.
  - d. Test Method: Test joint sealants according to "Method A, Field-Applied Sealant Joint Hand Pull Tab", in Appendix X1 in ASTM C1193 "Standard Guide for Use of Joint Sealants" or "Method A, Tail Procedure" in ASTM C1521 "Standard Practice for Evaluating Adhesion of Installed Weatherproofing Joints". For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side

- e. Report whether or not sealant in joint connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate.
  - f. Evaluation of Field Test Results: Joint sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use joint sealants which fail to adhere to joint substrates during testing.
- F. Pre-Installation Meeting: Prior to the installation of sealant, meet at the Project site to review the material selections, joint preparations, installation procedures and coordination with other trades. Meeting shall include the Architect, Contractor, the Sealant Installer, manufacturer's representative, and representatives of other trades or subcontractors affected by the sealant installation. Examine sample installations which have been prepared and determine (and record) whether everyone present is in agreement that the proposed installations are likely to perform as required

#### **1.6 DELIVERY, STORAGE AND HANDLING**

- A. Delivery: Deliver materials to Project site in manufacturer's unopened containers, with manufacturer's name, brand, hardness, type, class, grade, and color fully indicated thereon. In addition, provide manufacturer's expiration date on sealant containers and/or include with shipping and installation packaging. Store in accordance with manufacturer's instructions.

#### **1.7 PROJECT/SITE CONDITIONS**

- A. Temperature Limitations: Do not install materials when the temperature is below 40 deg. F. (4.5 deg. C.), unless the manufacturer specifically recommends application of his materials at lower temperatures. If job progress or any other condition requires installations when temperatures are below 40 deg. F. (4.5 deg. C.) (or below the minimum installation temperature recommended by the manufacturer) consult the manufacturer's representative and establish the minimum provisions required to ensure satisfactory work. Record in writing to the manufacturer, with copy to the Architect, the conditions under which such installation must proceed and the provisions made to ensure satisfactory work.
- B. Weather Limitations: Do not proceed with installation of bulk compounds during inclement weather unless all requirements and manufacturer's instructions can be complied with and unless the work can proceed in accordance with the agreements of the pre-installation meeting. Do not proceed with the installation of elastomeric joint sealants under extreme temperature conditions which would cause joint openings to be at either maximum or minimum width or when such extreme temperatures or heavy wind loads are forecast during the period required for initial or nominal cure of elastomeric joint sealants. Whenever possible, schedule the installation and cure of elastomeric joint sealants during periods of mean temperatures (nominal joint width shown) so that subsequent stresses upon the cured joint sealants will be minimized.

#### **1.08 WARRANTIES**

- A. General: Warranties and guaranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and are in addition to and run concurrent with other warranties and guaranties made by the



Contractor under requirements of the Contract Documents

- B. Special Warranty, Polyurethane Sealants: Submit a five (5) year written warranty signed by the Contractor and Installer, and addressed to the Owner and assignable to all future Owners within this warranty period, agreeing to repair or replace sealant compounds which have failed to provide airtight and watertight joints for any reason, or which appear to have failed in adhesion, cohesion, abrasion-resistance, migration-resistance, stain-resistance, general durability or any other form of apparent deterioration (excluding inherent qualities and limitations clearly specified in the manufacturer's data which was submitted). Comply with these Specifications for repair or replacement of work.
- C. Special Warranty, Silicone Sealants: Submit a twenty (20) year written warranty signed by the Contractor and Installer, and addressed to the Owner and assignable to all future Owners within this warranty period, agreeing to repair or replace silicone sealant compounds which have failed to provide airtight and watertight joints for any reason, or which appear to have failed in adhesion, cohesion, abrasion-resistance, migration-resistance, stain-resistance, general durability or any other form of apparent deterioration (excluding inherent qualities and limitations clearly specified in the manufacturer's data which was submitted). Comply with these Specifications for repair or replacement of work.
- D. Special Warranty, Stain Resistance: Submit a twenty (20) year written warranty signed by the Contractor and Installer, and addressed to the Owner and assignable to all future Owners within this warranty period, agreeing to repair or replace sealant compounds which have stained contiguous materials (excluding inherent qualities and limitations clearly specified in the manufacturer's data which was submitted). Comply with these Specifications for repair or replacement of work.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS, BULK COMPOUNDS**

- A. General: Provide joint sealants, joint fillers and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience. Use non-sag compounds for other areas except as shown or specified.
- B. VOC Content of Interior Sealants: Provide interior sealants and sealant primers that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
  - 1. Sealants: 250 g/L.
  - 2. Sealant Primers for Nonporous Substrates: 250 g/L.
  - 3. Sealant Primers for Porous Substrates: 775 g/L.
- C. Elastomeric Compounds
  - 1. Silicone Rubber (Marked SE-2): ASTM C920, Type S, Grade NS, neutral cure, Class and Use as best suited for the intended purpose; provide one of the following:
    - a. "795 Building Sealant" or "790 Silicone Building Sealant" (Dow Corning

- Corp.).
- b. "SilPruf SCS2000" (Momentive Performance Materials).
  - c. "Sikasil WS-305 Building Sealant" (Sika Corp.).
  - d. "Spectrem 1" or "Spectrem 2" (Tremco).
2. Structural Silicone Rubber (Marked SE-1): ASTM C920 Type S, Grade NS, neutral cure, and ASTM C1184 requirements, is compatible with system components with which it comes in contact, and is specifically formulated and tested for use as a structural sealant; Class and Use as best suited for the intended purpose; provide one of the following:
    - a. "995 Structural Glazing Sealant" (Dow Corning Corp.) for field use and "983 Silicone Glazing and Curtainwall adhesive/sealant"(Dow Corning Corp.) for use in the shop.
    - b. "Ultraglaze SSG4000AC Silicone Structural Glazing Sealant" (Momentive Performance Materials); and "Ultraglaze SSG4600 Silicone Structural Glazing Sealant" (Momentive Performance Materials) for use in the shop.
    - c. "Sikasil SG-18 Building Sealant" (Sika Corp.) for field use and "Sikasil SG-18 Building Sealant" or SG-500 Silicone Building Sealant" (Sika Corp.) for use in the shop.
    - d. "Proglaze SSG" (Tremco, Inc.) for field use, and Proglaze II (Tremco, Inc.) for use in shop).
  3. One-Part Polyurethane (Marked SE-?3: ASTM C920, Type S, Grade NS. Class and Use as best suited for the intended purpose; provide one of the following:
    - a. "Dymonic 100" (Tremco).
    - b. "Sikaflex 1a" (Sika Chemical Co.).
    - c. "Dynatrol I-XL" (Pecora).
  4. Silicone Sanitary Rubber (Marked SE-4): ASTM C920, Type S, Grade NS; provide white color unless otherwise shown or specified. Provide one of the following:
    - a. "Silicone Sanitary SCS 1700 Sealant" (Momentive Performance Materials).
    - b. "786 Mildew Resistant Silicone Sealant" (Dow Corning Corp.).
    - c. "898NST Sanitary Silicone Sealant" (Pecora).
    - d. "Tremsil 200" (Tremco).
  5. Acrylic Latex (Marked SE-5): ASTM C834 Non-sag emulsion sealant, suitable for  $\pm 7.5$  percent joint movement; Provide one of the following:

- a. "AC-20" (Pecora).
  - b. "Tremflex 834" (Tremco).
  - c. "Sonolac" (BASF Corp.).
  - a. Acoustical Sealant (Marked SE-6)
- 6. Fire Rated sealant marked as SE-7: Refer to section 07 84 00 "Firestopping".
- B. Bituminous Compounds
  - 1. Rubberized Bituminous Compound (Marked SE-?): ASTM D1190.
  - 2. Rubberized Bituminous Compound Jet Fuel Resistant (Marked SE-?): ASTM D1854.
- C. Tape Sealants
  - 1. Butyl Mastic Tape: Polyisobutylene-butyl or butyl reinforced tape. Self-adhesive, non-drying, non-hardening.
    - a. "PTI 606" (Parr Tech LLC)
    - b. "Tremco 440 Tape" (Tremco Inc.)
- D. Color of Sealant: For concealed joints provide manufacturer's standard color which has the best overall performance qualities for the application shown. For exposed joints the Architect will select colors from the manufacturer's standard colors unless special colors are shown or specified.

## **2.2 JOINT FILLER MATERIALS**

- A. Preformed Sponge Rubber or Cork: ASTM D1752, Type I, II or III; type best suited for joint condition.
- B. Closed Cell Neoprene: ASTM D1056, Type S, Class SCE.
- C. Closed Cell Vinyl: ASTM D1667, Grade VE-41.
- D. Closed Cell Polyethylene: Not less than 3 psi (21 kPa) for 25% compression resistance, highly resistant to petroleum oils and solvents, one of the following:
  - 1. "Expand-O-Foam" (Williams Products, Inc.).
  - 2. "Filler Foam Gasket FF-4" (Progress Unlimited Inc.)
- E. Compressible Rod: ASTM C1330; types as recommended by sealant manufacturer. Use non-gassing rod fillers, types as shown, or as required for proper performance of the sealant in the specific joint, which is compatible with sealant. Sealant compatibility shall be confirmed by the sealant manufacturer. Compatibility characteristics of sealants in contact with sealant backings shall be determined by ASTM Test Method C1087.

- F. Compressible Filler: Continuous closed cell neoprene complying with ASTM D1056; with pressure sensitive temporary positioning adhesive on one side; thickness and width as shown.
- G. Filler for Concrete Paving: ASTM D1751, asphalt-saturated cellulosic fiber.
- H. Filler for Concrete Pedestrian Walkways and Concrete Parking Garages: Provide non water absorbing type filler which has been tested for compatibility with the intended sealants. Fillers may be manufactured from polypropylene, polyethylene or polystyrene and shall be used for the purpose of resisting deflection of the joint under load and long term compatibility. Do not use typically asphaltic based or open cell polyurethane foam type materials for these type installations.
- I. Shape and Size: Select shape and size of joint filler in consultation with the manufacturer for proper performance in the specific condition of use in each case.

### **2.3 GASKET MATERIALS**

- A. Preformed Neoprene Compression Gasket: A hollow compartmentalized extrusion of neoprene, designed for compression within a joint with a minimum of air spaces, Shore A hardness of 55 +/- 5, tensile strength 2000 psi (137,895 kPa), one of the following:
  - 1. "Wabo Compression Joint Seal Heavy Duty Series" (Watson Bowman Acme).
  - 2. "Delastic Permanent Compression Seals" (D.S. Brown Co.)

### **2.4 AUXILIARY MATERIALS**

- A. Joint Cleaner: Provide nonstaining, chemical cleaners of type which are recommended by and acceptable to manufacturers of joint sealants and sealant backing materials, which are not harmful to substrates and adjacent nonporous materials, and which do not leave oily residues or otherwise have a detrimental effect on sealant adhesion or in-service performance.
- B. Joint Primer and Sealer: Provide non-staining compounds recommended by the manufacturer of the sealant for the specific joint surface and condition.
- C. Bond-Breaker Tape: Polyethylene tape as recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.
- D. Masking Tape: Provide nonstaining, nonabsorbent type compatible with joint sealants and to surfaces adjacent to joints.

## **PART 3 - EXECUTION.**

### **3.1 GENERAL**

- A. Manufacturer's Instructions: Prepare substrates, apply primers and install (erect, apply) the work of this Section, including (equipment, components, and) accessories in accordance with the manufacturer's instructions, except where more stringent requirements are shown or specified, and where project conditions require extra

precautions or provisions to ensure satisfactory performance of the Work.

### **3.2 EXAMINATION**

- A. Verification of Conditions: Examine the areas to receive the Work and the conditions under which the Work would be performed. Contractor shall remedy conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.
- B. Joint Widths: Do not proceed with sealant installation where joint widths are less than allowed for application intended. In addition, examine the substrates to determine if they are strong enough to withstand the forces which will be induced by the joint sealants. Repair or strengthen substrates as required before proceeding with the work.

### **3.3 PREPARATION**

- A. Substrate Acceptability: commencement of installation shall constitute acceptance of substrate conditions by the Installer.
- B. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealers to comply with the following requirements:
  - 1. Remove foreign material from joint substrates which could interfere with adhesion of joint sealer, including dust; paints, except for permanent, protective coatings tested and approved for sealant adhesion and compatibility; old joint sealers; oil; grease; waterproofing; water repellants; water; surface dirt; and frost.
  - 2. Clean concrete, masonry, unglazed surfaces of ceramic tile and similar porous joint substrate surfaces, by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealers. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
  - 3. Remove laitance and form release agents from concrete.
  - 4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile; and other nonporous surfaces by chemical cleaners or other means which are not harmful to substrates or leave residues capable of interfering with adhesion of joint sealers.
- C. Joint Priming: Prime or seal substrates, except where written reports of tests conducted by an independent testing agency have been submitted which demonstrate that primer or sealer is not required for the conditions of use and the substrates involved. Confine primers to areas of joint sealer bond, do not allow spillage or migration onto adjoining surfaces.
- D. Previously Treated Joints: Do not apply elastomeric compounds to joint surfaces previously treated with paint, lacquer, sealer, curing compound, water repellent or other coatings unless a laboratory test for durability of bond has been successfully completed in accordance with ASTM C794.
- E. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces which otherwise would be permanently stained or damaged by such

contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing sealant.

### **3.4 INSTALLATION**

- A. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:
  - 1. Where joint filler is used as backup for bulk compounds, install filler continuously to depth and shape required for proper application and performance of products. Install joint fillers to provide support of joint sealants during application and at position required to produce the cross-sectional shapes and depths of installed joint sealants relative to joint widths which allow optimum sealant movement capability. Provide watertight and airtight corners and joints in. Do not leave gaps between ends of joint fillers and do not stretch, twist, puncture, or tear joint fillers. Remove absorbent joint fillers which have become wet prior to sealant application and replace with dry material.
  - 2. Install bond breaker tape between joint sealants and joint fillers, compression seals, or back of joints where adhesion of sealant to surfaces at back of joints would result in sealant failure.
- B. Sealant Installation Standard: Comply with ASTM C1193 for installation of joint sealants as applicable to materials, applications and conditions indicated.
  - 1. Apply compounds in continuous beads without open joints, voids or air pockets so as to provide a watertight and airtight seal for the entire joint length and to allow optimum sealant movement capability.
  - 2. Apply compounds to the depth and width ratio recommended.
- C. Tooling of Joints: Immediately after sealant application and prior to time skinning or curing begins, tool joint sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess joint sealants from surfaces adjacent to joint. Do not use tooling agents which discolor joint sealants or adjacent surfaces or are not approved. Tool exposed surfaces of compounds to the profile shown or if none is shown, tool slightly concave to match configuration per Figure 8A in ASTM C1193, unless otherwise indicated.
- D. Self Leveling Compounds: Pour self-leveling compounds in horizontal joints to a level approximately 1/16 in. (1.5mm) below adjacent surfaces.
- E. Installation of Preformed Impregnated Foams: Install each length of foam immediately after removing protective wrapping, taking care not to pull or stretch material, utilizing installation methods, materials, and tools which produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of foam requires acceleration to produce seal, apply heat as recommended.
- F. Installation of Preformed Hollow Neoprene Gaskets: Install gaskets, with minimum number of end joints, in joint recesses with edges free of spalls and sides straight and parallel, both within tolerances. Apply recommended adhesive to joint substrates immediately prior to installing gaskets. For straight sections provide gaskets in continuous lengths; where changes in direction occur, adhesively splice gasket together

to provide watertight joint. Recess gasket below adjoining joint surfaces by 1/8 in. (3.1mm) to 1/4 in. (6.3mm).

- G. Horizontal Joints, General: Joints Not Subject to Traffic or Other Abrasion: Apply sealant to a depth equal to 50% of the joint width, but not less than 1/4 in. (6mm) and not more than 1/2 in. (13mm). Against rough surfaces or in joints of uneven widths avoid the appearance of excess sealant by locating the sealant well back into joint wherever possible. Tool exposed surfaces slightly concave, except provide a slight wash on horizontal joints where horizontal and vertical surfaces meet.
- H. Sidewalk, Pavement, and Similar Horizontal Joints: Apply sealant to a depth equal to 75% of the joint width, but not less than 3/8 in. (9.5mm) and not more than 3/4 in. (19.05mm) Pour self-leveling sealant in horizontal joints to a level 1/16 in. (1.58mm) below the adjoining surfaces, unless otherwise shown.

### **3.5 FIELD QUALITY CONTROL**

- A. Contractor's Quality Control Responsibilities: Contractor is solely responsible for quality control of the Work.
- B. Field-Adhesion Testing: During exterior joint sealant installation, field test sealant adhesion to joint substrates as follows:
  - 1. Extent of Testing: Test completed exterior elastomeric sealant joints as follows:
    - a. Perform 4 tests for the first 1000 ft. (300m) of joint length for each type of exterior elastomeric sealant and joint substrate.
    - b. Perform 1 test for each 1000 ft. (300m) of joint length thereafter or 1 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. For joints with dissimilar substrates, verify adhesion to each substrate separately; do this by extending cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
  - 3. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements. Record results in a field-adhesion-test log.
  - 4. Inspect tested joints and report on the following:
    - a. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. Compare these results to determine if adhesion passes field-adhesion hand-pull test criteria.
    - b. Whether sealants filled joint cavities and are free of voids.
    - c. Whether sealant dimensions and configurations comply with specified requirements.



5. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
  6. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.
  7. Evaluation of Field 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.
- C. Waterproof Test: After curing exterior compounds, test joints for leaks by applying a stream of water perpendicularly from a 3/4 in. (19mm) dia. hose equipped with a control valve, pressure gage, and 1/2 in. (12.5 mm) inside dia. brass nozzle. Adjust the water flow to 30 psi (207 kPa) at the nozzle inlet, and spray the water perpendicular to the joint at a distance 12 in. (300 mm) from the surface. Slowly move the nozzle back and forth for 5 minutes along a 5 ft. (1.5m) segment of joint. Starting from the lowest point and working upward, repeat the process on successive segments until every designated location has been tested. Test the sealed joint system of not less than 25% of the construction components. Test the sealed joint system comprised of the actual construction components. Conduct tests in the presence of the Architect's representative who will determine the actual percentage of joints to be tested and the period of waterflow exposure, based upon any evidence of leakage. Repair leaks or other defects and retest as directed. Repair or replace other work damaged by such leaks.

### **3.6 ADJUSTING**

- A. Cleaning: Clean off excess joint sealants or sealant smears adjacent to joints as work progresses by methods and with approved cleaning materials.

### **3.7 PROTECTION**

- A. Protection: Protect joint sealants and related accessories during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealers immediately and reseal joints with new materials to produce joint sealer installations with repaired areas indistinguishable from original work.
- B. Coatings: Do not apply paint or other coatings near joint surfaces until after sealants have been installed and are nominally cured, so that adhesion will not be impaired by migration of such substances onto the joint surfaces.

**END OF SECTION**



**SECTION 08 11 13  
HOLLOW METAL DOORS AND FRAMES**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. General: Provide hollow metal doors and frames in accordance with requirements of the Contract Documents.
- B. Related Work Specified Elsewhere
  - 1. Section 01 81 13 "Sustainable Design Requirements" for additional references, definitions, documentation requirements, action plans, meetings, and performance requirements of products and systems.
  - 2. Furnishing of finish hardware is specified in Section 08 70 00 "Hardware".
  - 3. Wood doors are specified in Section 08 14 00 "Wood Doors".
  - 4. Glass and glazing for hollow metal frame partitions and hollow metal doors is specified in Section 08 80 00 "Glazing".
  - 5. Finish painting of hollow metal doors and frames is specified in Section 09 91 00 "Painting".

**1.2 REFERENCES**

- A. General: Comply with the applicable provisions of the referenced standards except as modified by governing codes and the Contract Documents. Where a recommendation or suggestion occurs in the referenced standards, such recommendation or suggestion shall be considered mandatory. In the event of conflict between referenced standards, this specification or within themselves, the more stringent standard or requirement shall govern.
- B. American Welding Society (AWS)
  - 1. AWS D1.1 "Structural Welding Code - Steel".
  - 2. AWS D1.3 "Structural Welding Code - Sheet Steel".
- C. American National Standards Institute (ANSI) and Steel Door Institute (SDI)
  - 1. ANSI/SDI A250.3 "Test Procedure and Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames".
  - 2. ANSI/SDI A250.4 "Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors".
  - 3. ANSI/SDI A250.6 "Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames".
  - 4. ANSI/SDI A250.8 "Recommended Specifications for Standard Steel Doors and Frames".



**SECTION 08 11 13  
HOLLOW METAL DOORS AND  
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5. ANSI/SDI A250.10 "Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces".
6. ANSI/SDI A250.11 "Recommended Erection Instructions for Steel Frames".
- D. National Association of Architectural Metal Manufacturers (NAAMM)
  1. NAAMM AMP 500 "Metal Finishes Manual"
  2. NAAMM HMMA 802 "Manufacturing of Hollow Metal Doors and Frames".
  3. NAAMM HHMA 810 "Hollow Metal Doors".
  4. NAAMM HHMA 820 "Hollow Metal Frames".
  5. NAAMM HHMA 831 "Recommended Hardware Locations for Hollow Metal Doors and Frames".
  6. NAAMM HHMA 840 "Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames".
  7. NAAMM HHMA 850 "Fire-Rated Hollow Metal Doors and Frames".
- E. National Fire Protection Association (NFPA): NFPA 80, "Standard for Fire Doors and Windows".
- F. Steel Door Institute (SDI)
  1. SDI 112 "Galvanized/Galvannealed Standard Steel Doors and Frames".
  2. SDI 117 "Manufacturing Tolerances for Standard Steel Door and Frames"
  3. SDI 118 "Basic Fire Door Requirements".
  4. SDI 122 "Installation and Troubleshooting Guide for Standard Steel Doors and Frames".
- G. Underwriters Laboratories Inc. (UL): UL 63, "Standard for Safety of Fire Door Frames".
- H. The U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

**1.3 DEFINITIONS**

- A. Steel Sheet Thicknesses: Thickness dimensions, including those referenced in ANSI A250.8, are minimums as defined in referenced ASTM standards for both uncoated steel sheet and the uncoated base metal of metallic-coated steel sheets.

**1.4 SUBMITTALS**

- A. Product Data: Submit for Architect's action. Submit manufacturer's technical literature and specifications describing the general properties of each material and accessory to be used in the Work including a material list with technical data documenting the location



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and primary function, quality, and performance of each material component or system to be used in the Work, including fire and acoustical ratings, or other primary characteristics as required by the Contract Documents.

- B. Shop Drawings:** Submit Architect's action. Submit shop drawings for the fabrication and installation of the Work. Prepare details at not less than 3 in. = 1 ft. (1:5) minimum scale.
1. Submit shop drawings for hollow metal doors and frames which shall include for each opening, details of frame, elevation of door design type, conditions at opening, details of each different wall condition, construction including horizontal and vertical edge conditions, details of joints and connections, metal thickness for components, description of anchorage, field splices and accessory items and location and preparation of reinforcement and installation requirements for finish hardware.
    - a. **Coordination Drawings:** As part of shop drawing submittal, submit complete coordination drawings of each opening, including door and frame, drawn to scale and coordinating door hardware. Show elevations of each door design type, showing dimensions, locations and types of door hardware, and preparations for power, signal, and electrified control systems.
      - 1) Indicate coordination of glazing frames and stops with glass and glazing requirements. Include details of moldings, removable stops and glazing types utilizing reference numbers as specified in Section 08 80 00 "Glazing".
    - b. **Schedule of Doors and Frames:** As part of shop drawing submittal, submit a complete schedule of doors and frames utilizing reference numbers for details and openings as shown.
    - c. **Electric Hardware Devices:** Indication of preparation for and routing of electrical metal raceway or electrical conduit for electrified hardware devices.
- C. Samples:** Submit Architect's action. Label samples to indicate product, characteristics, and location in the Work. Samples will be reviewed for color and appearance only. Furnish sufficient samples to establish the full range of colors and textures for materials exposed in the finished work. Compliance with other requirements is the responsibility of the Contractor. Submit the following:
1. 18 in. (400mm) x 24 in. (600mm) cut-away sample door with provisions for lockset and a pair of hinges and corner section of door frame. Include samples of anchorage. Show vertical-edge, top, and bottom construction; core construction; and hinge and other applied hardware reinforcement.
  2. 18 in. (400mm) x 24 in. (600mm) cut-away sample frame complete with specified glass and glazing.
- D. Quality Control Submittals:** Submit for Architect's information:
1. **Test Reports**
    - a. **Product Test Reports** based on evaluation of comprehensive tests



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performed by a qualified testing agency, for each type of hollow metal door and frame assembly.

- b. STC Test Reports: Certified test reports from an independent testing laboratory showing STC ratings for acoustical door assemblies.

2. Certificates

- a. Document Review: Before commencing work, submit a written statement signed by the Contractor and the Applicator certifying that the Contract Documents, shop drawings and product data have been reviewed with material manufacturers' qualified technical representatives and that they agree the selected materials are proper, compatible with contiguous materials and adequate for the application shown.
- b. Fire Rated Labeled Opening Certificates: Manufacturer's certification for each hollow metal door and frame metal unit which is shown for a labeled opening but is larger than the size limitations established by the labeling authority having jurisdiction. State that the unit has been constructed in accordance with applicable requirements for labeled construction.
- c. Primer Certification: Certification that the prime finish on the hollow metal doors and frames has been tested and complies with ANSI/SDI A250.10.
- d. Primer: Description of primer and method of application proposed for factory primed hollow metal doors and frames. Describe process utilized in treating and priming galvanized and metallic coated sheet steel doors and frames.

- 3. Installer's Qualifications: Evidence of successful completion of work of similar scope to that shown and specified for this Project.

- 4. Manufacturer's Qualifications: Evidence that the specified materials have been manufactured by the same source and successfully utilized for a minimum of 5 years on projects of a similar scope to that shown and specified for this Project.

**1.5 QUALITY ASSURANCE**

- A. Qualified Installer: The hollow metal doors and frames Work shall be performed by an installer having 5 years experience in the installation of specified materials on comparable projects. The installer shall have the approval of the hollow metal door and frame materials manufacturer.
- B. Single-Source Responsibility: Obtain hollow metal doors and frames from one source of a single manufacturer. Obtain accessory products used in conjunction with hollow metal doors and frames from the hollow metal doors and frames manufacturer or from sources acceptable to the hollow metal doors and frames manufacturer.
- C. Fire Rated Door and Frame Manufacturer Qualifications: Hollow metal doors and frames for fire rated openings shall be manufactured by a firm whose units are inspected, tested, listed and labeled by UL for single point hardware.
- D. Requirements Of Regulatory Agencies



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1. General: Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from authorities having jurisdiction.
  2. NFPA Label Requirements: Comply with the label requirements of NFPA and UL. Fabricate units in accordance with requirements of NFPA Standard No. 80, ANSI/UL 10B and UL Standard for Safety No. 63 "Outline for Proposed Investigation for Fire Doors and Frames" and for the class of door opening corresponding to the hourly rating scheduled. Provide required labels permanently fastened on each door and frame assembly which is within the size limitations established by the labeling authority having jurisdiction. Provide anchors for labeled frames as required by authority having jurisdiction.
  3. Temperature Rise Rating: At stairwell enclosures, provide doors which have a Temperature Rise Rating of 450°F (250 deg. C.) maximum in 30 minutes of fire exposure.
  4. Test Pressure: Test according to NFPA 252 or UL 10C. After 5 minutes into the test, the pressure level in furnace shall be established at 40 in. (1m) or less above the sill.
  5. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257 or UL9. Label each individual glazed lite.
  6. Smoke-Control Door Assemblies: Comply with NFPA 105 or UL 1784.
- E. Safety Glazing Materials: Comply with the requirements of 16 CFR 1201 of the Consumer Products Safety Act with respect to glass and glazing provided in conjunction with hollow metal doors and frames. Refer to Section 08 80 00 "Glazing".
- F. Pre-Installation Meetings: Prior to the start of the Work, meet at the Project site to review methods and sequence of hollow metal doors and frames installation, special details and conditions, standard of workmanship, testing and quality control requirements, job organization and other pertinent topics related to the Work.

**1.6 DELIVERY, STORAGE AND HANDLING**

- A. Precautions: Protect hollow metal door and frame units from damage during transit, storage and installation. Tool marks, rust, blemishes and other damage on exposed surfaces will not be acceptable. Store material in a dry location, off the ground and in a manner as to prevent deterioration. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber. If door packaging becomes wet, remove cartons immediately. Provide spaces between stacked doors to permit air circulation.
- B. Delivery: Deliver hollow metal door frames packaged with one (1) frame per bundle, marked with frame type, size, swing and wall thickness. Deliver welded frames with two removable shipping and handling spreader bars across bottom of frames, tack welded to jambs and mullions (remove when installing frames). Inspect doors and frames on delivery for damage, and notify shipper and supplier if damage is found.



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**PART 2 - PRODUCTS**

**2.1 MATERIALS**

- A. Cold Rolled Sheet Steel: ASTM A1008/A1008M, Commercial Sheet (CS), Type B; suitable for exposed applications; free from scale, pitting or other defects; stretcher leveled standard of flatness for doors.
- B. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Galvanized Sheet Steel: ASTM A653/A653M, G90 (Z275 275 g/m<sup>2</sup>) coating (minimum spangle), commercial quality, mill phosphatized; stretcher leveled standard of flatness for doors.
- D. Metallic Coated Sheet Steel: ASTM A653/A653M and ASTM A924, Commercial Steel (CS), Type B, with an A60 zinc-iron-alloy (galvannealed) coating, mill phosphatized; stretcher leveled standard of flatness for doors. Factory prepare metallic coated sheet steel components to receive finish painting in the field.
- E. Reinforcing Steel, Supports and Anchoring Devices: Structural steel, ASTM A36/A36M; or sheet steel, ASTM A1008/A1008M cold-rolled or ASTM A1011/A1011M hot-rolled and ASTM A568/A568M; but not less than 16 gauge (1.5mm); hot-dip galvanize after fabrication; comply with ASTM A153/A153M, Class B.
- F. Frame Anchors: Steel sheet complying with ASTM A1008 (A1008M) or ASTM A1011/A1011M, hot-dip galvanized according to ASTM A153 (A153M), Class B.
- G. Core Filler: Sound deadening and heat-retarding mineral fiber insulating material. At doors required to have temperature rise rating, provide mineral fiberboard core.
  - 1. Exterior Thermal-Rated (Insulated) Doors: Provide doors fabricated with cores which have a thermal-resistance value (R-value) of not less than 4.0 deg F x h x ft.<sup>2</sup>/Btu (0.704 K x m<sup>2</sup>/W) when tested according to ASTM C1363.
- H. Fasteners: Galvanized or cadmium plated steel.
  - 1. Bolts and Nuts: ANSI/ASME B18.2.1, B18.2.2, and ASTM A307, Grade A; with ASTM A563/A563M hex nuts and, where indicated or required, flat washers.
  - 2. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete:
    - a. Interior Material: Carbon-steel components zinc-plated to comply with ASTM B633, Class Fe/Zn 5.
    - b. Exterior Material: Alloy Group 1 or 2 stainless-steel bolts complying with ASTM F593 and nuts complying with ASTM F594.
  - 3. Machine Screws: ANSI/ASME B18.6.3, and ASTM A307, carbon steel, Phillips flat head.



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- I. Shop Primer: A baked-on, air dried, or properly cured rust inhibiting 'direct to metal' type primer compatible with the respective specified finish paint and complying with the chemical preparation, painting, testing procedure, evaluation and acceptance criteria of ANSI/SDI A250.10
- J. Dielectric Separator SSPC Paint 12, compounded for 15 mils (0.4mm) dry film thickness per coat; Cold applied type, inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities, non-sagging, resistant to severe corrosion conditions; applied in two coats for an overall minimum dry film thickness of 30 mils (0.8mm).
- K. Grout: Comply with ASTM C476, with a slump of 4 in. (100mm) for standard hollow metal door frames built into concrete or masonry, as measured according to ASTM C143.

**2.2 FABRICATION**

- A. General: Fabricate doors and frames to the design and dimensions shown and scheduled in accordance with best shop practices and in compliance with SDI 117 "Manufacturing Tolerances Standard Steel Door and Frames". Unless otherwise shown or specified, fabricate doors and panels to a thickness of 1-3/4 in. (44mm). Take field measurements where coordination with adjoining work is necessary.
- B. Workmanship: Make hollow metal door and frame work strong, rigid, neat in appearance and free from defects. Reinforce corners of doors as required to prevent twisting or sagging. Form exposed surfaces free from warp, wave and buckle, with corners square, unless otherwise shown. Form molded members straight and true, with welded joints coped or mitered, well formed, and in true alignment. Provide a full miter continuously welded on back side at frame corners with edges straight and true. Grind welds smooth and flush on exposed surfaces so they are invisible after finishing. Accurately machine, file and fit exposed connections with hairline joints unless otherwise shown. Conceal fastenings wherever possible. Countersink exposed screws using flat, Phillips head screws. Provide welds of adequate strength and durability.
- C. Clearances: Provide clearances for doors, not otherwise specified or shown, as follows:
  - 1/8 in. (3mm) at jambs and heads, 1/8 in. (3mm) at meeting stiles of pairs of doors and 3/8 in. (9mm) at bottom where no threshold or carpet is required. Where a threshold is scheduled provide 3/8 in. (9mm) clearance above the threshold. Where carpet is scheduled provide 3/8 in. (9mm) clearance above the carpet. Prepare doors to receive weatherstripping where required.
  - 1. Provide clearances for labeled doors and panels within the limitations established by the authority having jurisdiction.
  - 2. Round lock edges of stiles for pairs of double acting doors; bevel lock edge 1/8 in. (3mm) in 2 in. (50mm) for other hollow metal doors. Provide [a rabbeted type astragal] [an overlapped steel astragal welded to the active leaf] [Dutch bend type flush astragals] for pairs of exterior doors and pairs of fire doors, unless otherwise shown.
- D. Preparation for Hardware: Factory prepare hollow metal doors and frames to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping, according to the Door Hardware Schedule and templates furnished including





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installation of galvanized steel conduit for routing of low voltage wire from electrical hinges to electro-mechanical locks, in accordance with reviewed hardware schedule and templates. Provide steel reinforcing, drill and tap for doors and frames to receive surface applied hardware, except at push plates and kickplates provide reinforcing only. Use steel secured by spot welding as reinforcement. Prepare doors and frames in accordance with ANSI/SDI A250.6 and NAAMM HHMA 831, except with the following modifications:

1. Butt and Intermediate Pivot Hinge Reinforcements: 10 gauge (3.4mm) or equivalent number of threads on doors and 7 gauge (4.6mm) on frames.
2. Top and Bottom Pivot Reinforcements: 7 gauge (4.6mm) steel by size as required by hardware manufacturer.
3. Lock Fronts: 12 gauge (2.7mm) by size as required by approved hardware manufacturer.
4. Flush Bolts: 12 gauge (2.7mm) by size as required by approved hardware manufacturer.
5. Lock Reinforcement Units: 14 gauge (1.9mm) by size as required by hardware manufacturer.
6. Closers and Hold Open Arms: 12 gauge (2.7mm) one-piece channel, size as required by approved hardware manufacturer but not less than 6 in. (150mm) high.
7. Panic Device Reinforcement: 14 gauge (1.9mm) thick by 20 in. (500mm) high by 4 in. (100mm) wide centered on panic device case body, unless otherwise recommended by panic device manufacturer.
8. Other Hardware: Other hardware reinforcements as required for adequate strength and anchorage.

**E. Astragals**

1. Rabbeted type astragal: Provide as an integral part of door unless otherwise shown or scheduled. Make astragal of thicknesses of metal of the same gauge as face sheet. On opposite door leaf, provide a reveal from top to bottom for rabbeted type astragal, to lay flush with face.
2. Applied Astragal: Provide 10 gauge (3.4mm), 1-1/2 in. (38mm) wide flat surface steel sheet astragals for exterior pairs of doors and where shown or scheduled. Secure to doors with spot welds at maximum 4 in. (100mm) centers and 1 in. (25mm) from ends. No cutouts permitted in astragals.
3. Location of Astragals for Exterior Doors
  - a. Outswinging: Astragal on exterior side of active door leaf.
  - b. Inswinging: Astragal on exterior side of inactive leaf.

**F. Stops And Moldings**

1. Doors





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- a. Fixed Frame Moldings: Formed integral with steel doors, min. of 5/8 in. (16mm) high unless otherwise indicated.
- b. Removable Moldings for Glazed Lites in Doors: Min. 16 gauge (1.5mm) thick, fabricated from same material as door face sheet in which they are installed punched and countersunk to receive flush mounted screws.
- 2. Frames
  - a. Fixed Frame Moldings: Formed integral with hollow metal frames, min. of 5/8 in. (16mm) high unless otherwise indicated.
  - b. Loose Stops for Glazed Lites in Frames: Min. 16 gauge (1.5mm) thick, fabricated from same material as frames in which they are installed punched and countersunk to receive flush mounted screws.

**G. Electrical Requirements**

- 1. General: Make provisions for installation of electrical items; arrange in manner so wiring can be readily removed and replaced.
- 2. Doors and Frames with Electric Hinges
  - a. General: Provide metal conduit raceway to permit wiring from electric hinge to other electric door hardware.
  - b. Hinge and Pivot Location: Center or intermediate as applicable; top or bottom not permitted.
  - c. Back Box for Electric Hardware Items: Weld back boxes for electric hardware items. Weld Dust cover boxes or mortar guards for electrical hinges.
- 3. Future Work: Where marked /F, provide cutouts in doors and door frames to receive electronic door hardware at a future date.

**2.3 FLUSH SEAMLESS DOORS**

- A. Standards and Door Construction: Fabricate flush doors with minimum gauge face sheets specified below, with edges welded and finished flush. Provide seamless construction, with no seams or joints on door faces or edges, and continuous vertical mechanical interlocking joints at lock and hinge edges; intermittently welded, with 1 in. (25mm) long tack-welds spaced a minimum of 6 in. (150mm) o.c. vertically. Provide tack-welds at top and bottom of each hardware cutout. Fill edge seams with epoxy filler and ground smooth. No body filler or "bondo" shall be allowed. Comply with the following:
  - 1. Compliance: Provide metal doors complying with ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical-endurance level and models:
    - a. Interior Flush Doors 7 ft. (2.1m) and below in height: ANSI/SDI A250.8 Level 2 and ANSI/SDI A250.4 Physical Performance Level 'B', heavy-duty, Model 2, Seamless Design, minimum 18 gauge (1.2mm) cold-rolled sheet steel faces or metallic coated sheet steel faces.

- b. Interior Flush Doors above 7 ft. (2.1m) height: ANSI/SDI A250.8, Level 3 and ANSI/SDI A250.4 Physical Performance Level 'A', extra heavy-duty, Model 2, Seamless Design, minimum 16 gauge (1.5mm) cold-rolled sheet steel faces or metallic coated sheet steel faces.
- c. Exterior Flush Doors: ANSI/SDI A250.8, Level 3 and ANSI/SDI A250.4 Physical Performance Level 'A', extra heavy-duty, Model 2, Seamless Design, minimum 16 gauge (1.5mm) galvanized steel faces. Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
- 2. Reinforcement: Reinforce face sheets of flush doors with 20 gauge (0.9mm) hat channels placed back to back spaced not over 6 in. (150mm) apart and spot welded to face sheets not more than 6 in. (150mm) o.c. Provide flush inverted 16 gauge (1.5mm) steel channels welded to face sheets at top and bottom of door. Place filler between reinforcing members for full height of door. Provide removable moldings of 18 gauge (1.2mm) steel for glazed openings in doors applied with countersunk screws spaced not more than 12 in. (150mm) on center.
- 3. Provide integral fixed glazing stops on secure side of door and removable mitered moldings of 16 gauge (1.5mm) steel for glazed openings in doors applied with countersunk screws spaced not more than 12 in. (150mm) on center and max. 2 in. (50mm) from ends.

## **2.4 STILE AND RAIL DOORS**

- A. Standards and Door Construction: Fabricate doors with minimum gauge face sheets below, with edges welded and finished flush. Provide seamless construction, with no seams or joints on door stile or and rail faces or edges, and continuous vertical mechanical interlocking joints at lock and hinge edges; intermittently welded, with one inch long tack-welds spaced a minimum of 6 in. (150mm) o.c. vertically. Provide tack-welds at top and bottom of each hardware cutout. Fill edge seams with epoxy filler and ground smooth. No body filler or "bondo" shall be allowed. Comply with the following:
  - 1. Compliance: Provide metal doors complying with ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical-endurance level and models:
    - a. Interior Stile and Rail Doors: ANSI/SDI A250.8, Level 3 and ANSI/SDI A250.4 Physical Performance Level 'A', extra heavy-duty, Model 3, Stile and Rail Design, minimum 16 gauge (1.5mm) cold-rolled sheet steel faces or metallic coated sheet steel faces.
    - b. Exterior Stile and Rail Doors: ANSI/SDI A250.8, Level 3 and ANSI/SDI A250.4 Physical Performance Level 'A', extra heavy-duty, Model 3, Stile and Rail Design, minimum 16 gauge (1.5mm) galvanized steel faces or metallic coated sheet steel faces. Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
  - 2. Reinforcement: Reinforce face sheets of stile and rail doors with 20 gauge (0.9mm) hat shaped channel reinforcing members placed back to back spaced not over 6 in. (150mm) apart and spot welded to face sheets not more than 6 in. (150mm) o.c. Provide flush inverted 16 gauge (1.5mm) steel channels welded to



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face sheets at top and bottom of door. Place filler between reinforcing members for full height of door. Provide removable moldings of 18 gauge (1.2mm) steel for glazed openings in doors applied with countersunk screws spaced not more than 12 in. (300mm) on center.

3. Full Glazed Stile And Rail Doors: Form doors with stiles and rails of continuous steel channels, not lighter than 16 gauge (1.5mm), welded together to form a rigid tubular frame complying with ANSI 250.8, Level, extra heavy-duty, Model 3, minimum 16 gauge (1.5mm) cold-rolled sheet steel faces. Cover frame members with outer steel sheets not lighter than 16 gauge (1.5mm). Spot weld outer sheets to frame. Miter joints between stiles and rails and face weld continuously. Form glass moldings of steel not lighter than 18 gauge (1.2mm). Provide sound-deadening material on inside of stiles and rails.

### 2.5 FIRE RATED DOORS

- A. Compliance: Comply with the specifications herein for flush doors and to the requirements of Paragraph "Quality Assurance".
  1. Core for Fire Rated and Temperature Rise Rated Doors: a continuous mineral fireboard core, permanently bonded to the inside face of the outer sheets.
- B. Louvers in Fire Rated Doors: Where noted or where required for fire ratings by code or by authorities having jurisdiction, provide louvers constructed with movable blades closed by actuating fusible links at 150 deg. F. (66 deg. C.) and labeled and listed for use in fire-rated door assemblies of type and fire-resistance rating indicated by the same inspecting and testing agency who established fire-resistance rating of door assembly.

### 2.6 GASKETED DOORS

- A. Compliance: Comply with specifications herein for hollow metal doors and fabricate to the profiles scheduled to receive gaskets. Drill and tap as required.
- B. Provide gaskets of the type scheduled for the respective locations. Provide gaskets in single lengths for each side with uniform exposure, using attachments as required and as recommended by the gasket manufacturer.

### 2.7 DUTCH DOORS

- A. General: Fabricate as specified for flush type doors. Provide shelf with boxed edges and closed ends; fabricate from 16 gauge (1.5mm) galvanized steel sheet, unless otherwise shown. Support shelf on door manufacturer's standard steel brackets, unless otherwise shown.

### 2.8 FLUSH PANELS

- A. Forming of Panels: Form to thicknesses specified and dimensions shown and comply with applicable requirements for flush doors. Prepare panels for concealed support and anchorage.

### 2.9 DOOR LOUVERS

- A. Ventilation Louvers: Provide minimum 20 gauge (0.9mm) cold rolled steel sheet stationary ventilation type louvers (blades and baffles) matching inverted 'Y' blade type

complete with 18 gauge (1.2mm) steel frame. Do not stamp louvers directly into door panels. Refer to mechanical and architectural louver schedule(s) for size and location of louvers.

- B. Lightproof Louvers: Stationary lightproof louvers constructed with baffles to prevent light from passing from one side to the other, any angle; minimum 20 gauge (0.9mm) cold rolled steel sheet louvers matching 'Lightproof' blade type complete with 18 gauge (1.2mm) steel frame. Do not stamp louvers directly into door panels.
- C. Fire-Rated Automatic Louvers: Louvers constructed with movable blades closed by actuating fusible links and UL listed and labeled for use in fire-rated door assemblies of type and fire-resistance rating indicated by the same testing and inspecting agency that established fire-resistance rating of door assembly.

## **2.10 HOLLOW METAL DOOR FRAMES**

- A. General: Provide combination type, fully welded, hollow metal door frames (knocked-down frames will not be accepted) to be used as both door buck and trim, formed to standard frame profiles shown and, unless otherwise shown, of the following minimum gages:
  - 1. Interior Frames: 16 gauge (1.5mm) steel for doors 7 ft. (2.1m) and under; 14 gauge (1.9mm) steel for doors above 7 ft. (2.1m) and/or over 4 ft. (1.2m) wide. In addition, frames scheduled to receive electrical locking devices shall be minimum 14 gauge (1.9mm) steel.
  - 2. Exterior Frames: 14 gauge (1.9mm) galvanized steel.
  - 3. Glazed Light Frames: 16 gauge (1.5mm) steel, unless otherwise shown or specified.
  - 4. Acoustical Frames: 14 gauge (1.9mm) steel.
  - 5. Cased Opening Frames: 14 gauge (1.9mm) steel.
  - 6. Code Requirements: As required per authorities having jurisdiction.
- B. Corner Joints: Corner joints of frames shall have contact edges closed tight, with trim faces mitered and continuously welded and stops mitered. The use of gussets shall not be permitted.
- C. Throat Opening: Where partitions are set into door frames, fabricate frames with throat opening 1/8 in. (3mm) larger than partition thickness unless otherwise shown or specified.
- D. Anchorage
  - 1. Provide tee shaped corrugated or perforated metal anchors into adjoining masonry or concrete construction. Use adjustable anchors with friction fit for frames set in masonry. Weld to frames set in concrete. Fabricate anchors of hollow metal no lighter than the gauge used for the frame, 2-1/2 in. (62mm) wide by 10 in. (250mm) long, three (3) per jamb up to 7 ft. (2.1m) high and four (4) per jamb up to 8 ft. (2.4m) high, and for openings over 8 ft. (2.4m) high, provide 1 anchor for each 2 ft. (600mm) of height or fraction thereof.

2. Anchor frame jambs to concrete or masonry which has been placed prior to setting of frames with 3/8 in. (9mm) countersunk concealed flat head bolts into expansion type shields or inserts, provide one not more than 6 in. (150mm) from the top and bottom of each jamb with intermediate anchors spaced a maximum of 26 in. (650mm) o.c. with a minimum of 4 per jamb. Apply removable stops to cover anchor bolts.
  3. At fire rated frames in masonry construction, provide UL rated adjustable anchors consisting of spot welded straps and adjustable corrugated or perforated anchors. Gauge of strap and anchor; same as frame. Minimum size anchors; 2 in. (50mm) wide by 10 in. (150mm) long. Number of anchors shall be two (2) per jamb to 5 ft. (1.5m) jamb height, with one additional anchor for each additional 30 in. (750mm) or fraction thereof.
  4. Where frames are set into standard drywall or shaft wall (steel studs) weld 16 gauge (1.5mm) anchor clips to each jamb as follows:
    - a. Hinge Side:
      - 1) One anchor above and below top hinge.
      - 2) One anchor above each remaining hinge.
    - b. Strike Side: Match hinge side.
    - c. Clip Width: Match stud width.
  5. Provide vertical steel struts, 3/8 in. (9mm) x 2 in. (50mm) extended from top of frame at each jamb to supporting construction above, unless frame is set in masonry or attached directly to concrete. Bend top of struts at right angle and attach to supporting construction above by bolting, welding or other suitable anchorage. Use inserts or expansion anchors into supporting construction above. Provide bolted attachment of struts to frame at jambs to permit height adjustment during installation. Adapt jamb anchor clips at struts to permit adjustment.
  6. Provide 16 gauge (1.5mm) steel channel temporary spreaders at the bottom of 3 sided frames to prevent distortion during shipment and storage and to hold frames in proper position until anchorage and adjacent construction has been completed.
  7. Terminate bottom of frames at the indicated finished floor level. Where floor fill or setting beds occur support frame by adjustable clip angles anchored to the structural substrate. Angle floor clips shall be 12 gauge (2.7mm), welded to frame and punched for two (2) 3/8 in. (9mm) fasteners.
- E. Mullions and Transom Bars: Provide mullions and transom bars of closed or tubular construction with internal 16 gauge (1.5mm) reinforcement welded 4 ft. (1.2m) o.c minimum, or as otherwise shown. Attach members to heads and jambs of frame with butt-welded joints unless shown to be removable. Reinforce the joints with concealed clip angles of the same thickness as the frame.
- F. Head Reinforcement: Reinforce head of frames over 3 ft. (0.9m) wide with 12 gauge (2.7mm) steel channel unless a structural lintel is provided to support the wall



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construction above the frame or unless there is no wall construction above the frame.

- G. Mortise Enclosures: Provide full enclosing electrical junction boxes or mortar shields over mortises. Provide removable access plates in the heads of frames to receive concealed door closers. Offset reinforcement so that faces of hinges or keepers are flush with face of the frame rebate.
- H. Rubber Door Silencers: Provide holes for rubber door silencers: 3 for single doors and 4 for pairs of doors. Install plastic plugs in silencer holes to keep holes clear during contiguous construction. Remove plastic plugs and replace with rubber door silencers after hardware installation.
- I. Back Coating of Frames: Where frames are to be fully grouted, coat the back of the frame with bituminous paint.

### 2.11 FIRE RATED DOOR FRAMES

- A. Compliance: Comply with these specifications for hollow metal door frames, SDI 118 "Basic Fire Door Requirements and with requirements of local authorities having jurisdiction.

### 2.12 GASKETED FRAMES

- A. General: Comply with specifications for hollow metal door frames, and form to the profiles shown to receive gaskets. Drill and tap frames as required. Install gaskets in single lengths for each side with uniform exposure of 3/8 in. (9mm), using adhesive and other attachments as detailed and as recommended by the gasket manufacturer.

### 2.13 GLAZED DOORS AND FRAMES

- A. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
  - 1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.
  - 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.
  - 4. Provide loose stops and moldings on inside of hollow metal work.
  - 5. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.
- B. Forming: Form glazed light frames to the profiles shown. Provide anchors at jambs same as for door frames. Provide closed mullion sections same as for door frames. Fabricate from 16 gauge (1.5mm) steel for interior work and 14 gauge (1.9mm) galvanized steel for exterior work, unless otherwise shown or required. Miter, fit and weld corners of panel moldings for glass panels in sidelights and borrowed lights to form continuous frame around panels. Provide non-removable panel moldings on the exterior. Secure removable



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moldings with Phillips oval-head countersunk machine screws at 12 in. (300mm) on center.

- C. Glazing Strips: Provide continuous felt strips cemented in place, on bed and stop surfaces for interior light frames to be glazed so that at no time does metal touch glass.
- D. Glass and Glazing: As specified in Section 08 80 00 "Glazing".

### **2.14 SHOP PAINTING**

- A. Cleaning and Treating: Clean, treat and paint surfaces of fabricated hollow metal door and frame work, inside and out, whether exposed or concealed in the construction.
  - 1. Thoroughly clean metal surfaces of loose scale, shavings, filings, dirt and other deleterious materials by use of wire brushes or other effective means. Remove grease and oil by one of the methods specified in SSPC-SP-1 "Solvent Cleaning". Fill as required to fill seams in edges.
  - 2. If required, prepare galvanized and metallic coated hollow metal doors and frames to receive prime paint by chemically treating surfaces with phosphate compound or other approved means to assure maximum paint adhesion. Galvanized and metallic coated hollow metal doors and frames shall be treated and prime painted prior to finish coats of paint. Comply with requirements of Section 09 91 00 "Painting".
- B. Primer: Apply a sufficient number of coats of an approved enamel filler, baked on, to obtain uniformly smooth exposed surfaces. In addition, apply one coat of light-colored primer, baked on, to both inside and outside surfaces. Touch-up surfaces having runs, smears or bare spots.
  - 1. Apply 2 coats of metal primer to reinforcement and attachment steel and framing which will be in contact with masonry or concrete.
  - 2. Comply with SDI A250.3 for performance and acceptance criteria. Provide minimum mil thicknesses of coatings as recommended by the paint manufacturer.

## **PART 3 - EXECUTION**

### **3.1 GENERAL**

- A. Manufacturer's Instructions: Prepare substrates, and install the work of this Section, including components, and accessories in accordance with the manufacturer's instructions, except where more stringent requirements are shown or specified, and where project conditions require extra precautions or provisions to ensure satisfactory performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

### **3.2 EXAMINATION**

- A. Verification of Conditions: Examine the areas to receive the Work and the conditions under which the Work would be performed. Contractor shall remedy conditions





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detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

### 3.3 PREPARATION

- A. Substrate Acceptability: Commencement of installation shall constitute acceptance of substrate conditions by the Installer.
- B. 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.

### 3.4 INSTALLATION

- A. Hollow metal Frames: Set hollow metal frames at locations shown and scheduled, in perfect alignment and elevation, plumb, level, straight, true and free from rack. Brace frames to prevent displacement. Comply with provisions in SDI A250.11, unless otherwise indicated. Install fire-rated frames according to NFPA 80.
  - 1. Except for frames located in existing walls or partitions, place frames before construction of enclosing walls and ceilings.
  - 2. Extend frame anchorages below fills and finishes, except over membrane waterproofed areas. Anchor bottom of frames to floors with anchor bolts or with power driven fasteners. Coordinate the installation of built-in anchors for wall and partition construction as required with other work. For openings 90 in. (2.3m) or more in height, install an additional anchor at hinge and strike jambs.
  - 3. In masonry construction, provide at least three wall anchors per jamb; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Acceptable anchors include masonry wire anchors and masonry T-shaped anchors.
  - 4. In metal-stud partitions, provide at least three wall anchors per jamb; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Attach wall anchors to studs with screws
  - 5. After wall construction has been completed, remove temporary braces. Leave surfaces smooth and undamaged.
- C. Adjust and securely brace hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
  - 1. Squareness: Plus or minus 1/16 in. (1.6mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
  - 2. Alignment: Plus or minus 1/16 in. (1.6mm), measured at jambs on a horizontal line parallel to plane of wall.
  - 3. Twist: Plus or minus 1/16 in. (1.6mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
  - 4. Plumbness: Plus or minus 1/16 in. (1.6mm), measured at jambs on a perpendicular line from head to floor





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- D. Hollow Metal Door Installation: Comply with SDI A250.8. Fit hollow-metal doors accurately in frames, within clearances specified in SDI A250.8. Shim as necessary to comply with SDI 122.
  - 1. Install labeled fire doors and frames to meet requirements of the Insurance Inspection and Rating Bureaus having jurisdiction at the Project site so as to avoid rate penalty. Correct installation which would subject the Owner to a rate penalty. Install fire-rated doors with clearances as specified in NFPA Standard No. 80.
- E. Finish Hardware: Apply hardware in accordance Section 08 70 00 "Hardware" of these Specifications. Drill and tap for machine screws as required. Do not use self-tapping sheet metal screws. Anchor panels in place with concealed fasteners. Adjust door installation to provide uniform clearance at head and jambs, and to contact stops uniformly. Remove and replace doors which are found to be warped, bowed or otherwise damaged and cannot be properly fitted in frames.
- F. Provide scheduled glass and glazing in accordance with Section 08 80 00 "Glazing".

**3.5 ADJUSTING**

- A. Operation: Re-adjust, re-hang or replace doors which do not swing or operate freely.

**3.6 CLEANING**

- A. Prime-Coat Touchup: Immediately after installation, sand smooth rusted or damaged areas of prime coat and apply touch up of compatible air-drying primer. Upon completion of installation, clean exposed metal surfaces and leave ready for final painting.
- B. Clean glass in accordance with Section 08 80 00 "Glazing".

**3.7 PROTECTION**

- A. Protect units during construction period so that they will be without indication of deterioration, use or damage at time of acceptance.

**END OF SECTION**

**SECTION 08 14 00  
WOOD DOORS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. General: Provide wood doors in accordance with requirements of the Contract Documents.
  - 1. Section 01 81 13 "Sustainable Design Requirements" for additional references, definitions, documentation requirements, action plans, meetings, and performance requirements of products and systems.
  - 2. Furnishing of finish hardware is specified in Section 08 70 00 "Hardware".
  - 3. Hollow metal doors and frames are specified in Section 08 11 13 "Hollow Metal Doors and Frames".
  - 4. Glass and glazing for wood doors is specified in Section 08 80 00 "Glazing".
  - 5. Paints and coatings for field finishing of wood doors are specified in Section 09 91 00 "Painting".

**1.2 REFERENCES**

- A. Comply with the applicable provisions of the referenced standards except as modified by governing codes and the Contract Documents. Where a recommendation or suggestion occurs in the referenced standards, such recommendation or suggestion shall be considered mandatory. In the event of conflict between referenced standards, this specification or within themselves, the more stringent standard or requirement shall govern.
- B. American National Standards Institute (ANSI): "Standard for Hardwood and Decorative Plywood ANSI/HPVA HP-1".
- C. Architectural Woodwork Institute (AWI) / Woodwork Institute (WI) / Architectural Woodwork Manufacturers Association of Canada (AWMAC): "Architectural Woodwork Standards" (AWS).
- D. Department of Commerce (DOC): "Commercial Standard 171, Hardwood Veneered Doors".
- E. Forest Stewardship Council (FSC): "FSC-STD-01-001 "Principles and Criteria for Forest Stewardship"
- F. Window & Door Manufacturers Association (WDMA)
  - 1. I.S. 1A; Industry Standard for Architectural Wood Flush Door
  - 2. I.S. 6A; Industry Standard for Architectural Stile and Rail Doors
- G. The U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA

Accessibility Guidelines and ICC/ANSI A117.1.

### **1.3 SYSTEM DESCRIPTION**

#### **A. Performance Requirements**

1. Standards: In addition to requirements shown and specified, comply with applicable provisions for grading and workmanship of "Architectural Woodwork Standards" (AWS) and WDMA applicable standards.
2. Provide doors for the entire project complying with Window & Door Manufacturers Association "WDMA I.S.1-A Extra Heavy Duty" unless otherwise indicated.
3. Fire-Rated Wood Doors: Provide fire rated doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10B/10C.

### **1.4 SUBMITTALS**

- A. Product Data: Submit for Architect's action. Submit manufacturer's technical literature and specifications describing the general properties of each material and accessory to be used in the Work including material list with technical data documenting the location and primary function, quality, and performance of each material component or system for each wood door type to be used in the Work. Include details of core and edge construction, trim for openings, and louvers with information as to fire and acoustical ratings, or other primary characteristics as required by the Contract Documents.
- B. Shop Drawings: Submit, for Architect's action, shop drawings for wood doors including associated frames showing location, size, and hand of each door; elevation of each kind of door; details for each different wall condition, construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data. Indicate the dimensions and locations of mortises and holes for scheduled hardware, dimensions and locations of cutouts, fire ratings for fire doors, requirements for veneer matching and finish requirements and other pertinent data. Show details of each condition at not less than 3 in. = 1 ft. (1:5) in scale.
  1. Coordination Drawings: As part of shop drawing submittal, submit complete coordination drawings of each opening, including door and frame, drawn to scale and coordinating door hardware. Show elevations of each door design type, showing dimensions, locations and types of door hardware, and preparations for power, signal, and electrified control systems.
    - a. Indicate coordination of glazing frames and stops with glass and glazing requirements. Include details of moldings, removable stops and glazing types utilizing reference numbers as specified in Section 08 80 00 "Glazing".
  2. Schedule of Doors and Frames: As part of shop drawing submittal, submit a complete schedule of doors and frames utilizing reference numbers for details and openings as shown.

- C. Samples: Submit for Architect's action. Label samples to indicate product, characteristics, and location in the Work. Samples will be reviewed for color and appearance only. Furnish sufficient samples to establish the full range of colors and textures for materials exposed in the finished work. Compliance with other requirements is the responsibility of the Contractor. Include samples of each type of door specified showing construction, finish, color and specular gloss selected. Samples shall be a 12 in. (300mm) x 12 in. (300mm) x full thickness corner section. Submit samples of acoustical hardware accessories.
  
- D. Quality Control Submittals: Submit for Architect's information:
  - 1. Test Reports: Copies of the following laboratory test results:
    - a. STC rating for each class specified.
  - 2. Certificates
    - a. Document Review: Before commencing work, submit a written statement signed by the Contractor and the Applicator certifying that the Contract Documents, shop drawings and product data have been reviewed with material manufacturers' qualified technical representatives and that they agree the selected materials are proper, compatible with contiguous materials and adequate for the application shown.
    - b. Manufacturer's certification that wood doors are manufactured to requirements of WDMA I.S.1 Industry Standard for Wood Flush Doors.
  - 3. Installer's Qualifications: Evidence of successful completion of work of similar scope to that shown and specified for this Project.
  - 4. Manufacturer's Qualifications: Evidence that the specified materials have been manufactured by the same source and successfully utilized for a minimum of 5 years on projects of a similar scope to that shown and specified for this Project.
  
- E. Closeout Submittals: Submit for Owner's documentation.
  - 1. Warranties: Special warranties as specified.
  - 2. Maintenance Manuals: Describing the materials, and procedures for cleaning and maintaining each type of wood door. Include manufacturer's data describing the materials and finishes used in the work.

## **1.5 QUALITY ASSURANCE**

- A. Qualified Installer: The wood door assemblies and accessories work shall be performed by an installer having 5 years experience in the installation of specified materials on comparable projects. The installer shall have the approval of the wood door materials manufacturer.
  
- B. Single-Source Responsibility: Obtain wood door assemblies from one source of a single manufacturer. Obtain accessory products used in conjunction with wood door assemblies from the wood door manufacturer or from sources acceptable to the wood door manufacturer. In addition, manufacturer shall be certified and licensed by the National



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Wood Window and Door Association (WDMA).

- C. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from authorities having jurisdiction.
  - 1. Fire-Rated Wood Doors: Comply with the label requirements of NFPA and UL, Warnock-Hersey, or other qualified testing agency acceptable to authorities having jurisdiction. Fabricate doors in accordance with requirements of NFPA 80 and NFPA 252 or UL 10B/10C for the class of door opening corresponding to the hourly rating shown, and which have been tested and rated for single point hardware by UL.
    - a. Provide UL label on each listed labeled door.
    - b. Provide required labels permanently fastened on each door which is within the size limitations established by the labeling authority having jurisdiction.
    - c. Test Pressure: Test at atmospheric pressure. After 5 minutes into the test, the neutral pressure level in furnace shall be established at 40 in. (1m) or less above the sill.
    - d. Temperature Rise Rating: In 30 minutes of fire exposure labeled doors shall be rated for maximum temperature rise of 450 deg F (250 deg. C.) for stair enclosures.
  - 2. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control, based on testing according to UL 1784.
  - 3. Safety Glazing Materials: Comply with the requirements of 16 CFR 1201 of the Consumer Products Safety Act with respect to glass and glazing provided in conjunction with wood doors. Refer to Section 08 80 00 "Glazing".

### 1.6 DELIVERY, STORAGE AND HANDLING

- A. Packaging: Package prefinished doors and panels in heavy duty cardboard cartons at the factory prior to shipment. Identify each door with individual opening numbers which correlate with designation system used on shop drawings for door, frames, and hardware, using temporary, removable or concealed markings.
- B. Delivery, Storage and Handling: Protect doors against damage during handling, transit and storage. Store in a dry place, protected from the weather. Stack in accordance with manufacturer's directions.

### 1.7 PROJECT/SITE CONDITIONS

- A. Site Conditions: Do not deliver or install doors until conditions for temperature and relative humidity have been stabilized and will be maintained in storage and installation areas during remainder of construction period to comply with the referenced AWI quality standard including Section 100-S-3 "Moisture Content" but in no case until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 deg. F. and 90 deg. F. (16 deg. C. and 32 deg. C.) and relative



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humidity between 43% and 70% during the remainder of the construction period.

### 1.8 WARRANTY

- A. Warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and are in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.
- B. Solid Core Interior Wood Door Special Warranty: Submit for Owner's documentation. Provide manufacturer's standard solid core interior door warranty for the life of the original installation. Warranty shall provide for removal of defective door and replacement and finishing of new door, including installation as originally specified. A representative of the door manufacturer shall inspect the installed doors and shall note on the warranty that no provisions of the warranty have been nullified in the manufacture and/or installation. Defects are defined to include, but not limited to the following:
  - 1. Delamination in any degree.
  - 2. Warp of 1/4 in. (6mm) or more in any 3 ft.-6 in. x 7 ft. (1m x 2m) section of a door. The term warp shall include bow, cup and twist.
  - 3. Telegraphing of any part of core assembly through face to cause surface variation of 0.01 in. (0.25mm) or more in a 3 in. (75mm) span.
  - 4. Any defect which may, in any way, impair or affect performance of the door for the purpose which it is intended.
- C. Solid Core Exterior Wood Door Special Warranty: Submit for Owner's documentation. Provide manufacturer's solid core exterior wood door warranty for 5 years from the date of the accepted original installation. Warranty shall provide for removal of defective door and replacement and finishing of new door, including installation including finish hardware) as originally specified. A representative of the door manufacturer shall inspect the installed doors and shall note on the warranty that no provisions of the warranty have been nullified in the manufacture and/or installation.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURER

- A. Provide wood doors for the entire project from one of the following manufacturers:
  - 1. Algoma Hardwoods Inc.
  - 2. Eggers Industries; Architectural Door Division.
  - 3. Marshfield Door Systems, Inc.
  - 4. VT Industries, Inc.

### 2.2 MATERIALS

- A. Particle Board Core: Single thickness slab of 3 ply particle board complying with ANSI

A208.1, Grade LD-1, [LD-2], average density not less than between 28 pcf (448kg/m<sup>3</sup>) to 32 pcf (512kg/m<sup>3</sup>), hot pressed with synthetic resin glue. Linear expansion shall not exceed 0.03% in either direction when tested in accordance with ASTM D1037, Sections 76 through 79. Faces of core slab shall be of 0.010 in. (0.25mm) thick flakes, with resin content a minimum of 50% higher than core resin content. Face layer density shall be a minimum of 25% higher than core density.

1. Use particleboard made with binder containing no urea formaldehyde resin.
- B. Structural Composite Lumber (SCL) Core: Manufactured with network of lumber strands laminated together with a waterproof adhesive to form a single solid core.
- C. Mineral Core: Incombustible mineral composition free of asbestos fiber.
- D. Top and Bottom Edge Bands: Thoroughly kiln dried hardwood.
- E. Blocking: Manufacturer's standard designed for purpose intended.
- F. Side Edge Bands: Thoroughly kiln dried hardwood, matching face veneers for natural finish.
- G. Crossbands: Minimum 1/16 in. (1.5mm) thick after sanding, properly dried hardwood.
- H. Face Veneer (For Natural Finish): Standard thickness, thoroughly dried conforming to CS35, Premium Grade. Match faces of doors in pairs and end match transoms. Where indicated, provide doors with faces produced from the same flitches as the adjacent wood paneling and arranged to provide the same matching as required for the wood paneling. Face veneer shall be tapeless spliced with grain running vertically, balanced and center matched, belt and polish sanded, of the following species:
1. Wood Veneer: **Refer to 06 40 00 "Architectural Woodwork"**
- I. Face Veneer (For Interior Painted Finish): Standard thickness sound grade hardwood veneer conforming to PS-1, overlaid with medium density cellulose fiber sheets impregnated with phenolic resin. Overlay shall weigh 0.058 psf (0.28 kg/m<sup>3</sup>) and shall have a minimum thickness of 12 mils (0.3mm) after pressing and curing.
- J. Adhesive: CS35, Type I (fully waterproof bond); Do not use adhesives containing urea formaldehyde.
- K. Primer: Primer sealer as standard with door manufacturer.

### **2.3 FABRICATION, GENERAL**

- A. Provide custom-fabricated flush wood doors of manufacture, type and detail to suit the conditions of required installation. Doors and panels shall be 1-3/4 in. (44mm) thick unless otherwise shown or specified. Comply with clearance requirements of referenced quality standard for fitting. Comply with requirements in NFPA 80 for fire-rated doors.
1. Hardwood Blocking Reinforcement: Provide additional solid hardwood blocking reinforcement (fire retardant treated if required) for mortise lock and latchset applications, surface mounted closers, panic hardware and as required by other type hardware manufacturers and authorities having jurisdiction. Blocking shall

be suitable to prevent fastener pull-out or other failure and install within core of door at locations necessary to eliminate through-bolting for surface mounted hardware.

2. Transom and Side Panels: Fabricate matching panels with same quality, appearance, fabrication type, exposed surfaces, and finish as specified for associated contiguous doors. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles unless otherwise indicated. Fabricate door and transom panels with full-width, solid-lumber, rabbeted, meeting rails. Provide factory-installed concealed attachment into jambs of metal door frames.
3. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.
  - a. Glazed Lights: Provide openings where shown for lights. Glazing molding beads shall be to profile shown of hardwood matching face veneers on natural finish doors, or with painted finish matching door finish. Provide adequate blocking for light openings in Type III Fabrication. Glass shall be as specified in Section 08 80 00 "Glazing".
  - b. Louvers: Factory install louvers in prepared openings.

## **2.4 FABRICATION TYPES**

- A. Type I Fabrication: AWS Section 9 Premium Grade, PC-5 (veneer) or PC-HPDL-5 (laminated) or SCLC-5 (Veneer) or SCLC-HPDL-5 (laminated).
  1. Core: Solid particleboard or structural composite lumber core.
  2. Vertical Stiles: Minimum 1-3/8 in. (34mm) wide after trimming, solid hardwood or engineered hardwood construction without fingerjoints, consisting of 5/8 in. (16mm) thick outerband (specie matching or compatible with face veneer) and 3/4 in. (19mm) thick mill option hardwood innerband.
  3. Top and Bottom Rails: Minimum 1-3/8 in. (34mm) wide after trimming, solid hardwood or engineered hardwood construction without fingerjoints. For doors scheduled to receive surface mounted overhead closers, utilize 5 in. (125mm) solid wood rails so that doors are not through-bolted.
  4. Crossbands: Full width of door with grain running horizontally, tapeless spliced without voids.
  5. Face Veneer: As specified, laminated to crossband and edges.
  6. Bonding
    - a. Core to stiles, rails and blocking utilizing adhesive.
    - b. Face veneers and crossbands to core and edges utilizing adhesive by hot plate process.
- B. Type IV Fabrication:



1. Core: Manufacturer's standard to provide STC rating shown or specified when tested in accordance with ASTM E90.
  2. Vertical Stiles: Minimum 1-3/8 in. (34mm) wide after trimming, 2 ply construction without fingerjoints, consisting of 5/8 in. (16mm) thick outerband (specie matching or compatible with face veneer) and 3/4 in. (19mm) thick mill option hardwood innerband.
  3. Bottom Rail: 2-1/8 in. (53mm) minimum mill option hardwood innerband.
  4. Top Rail: 1-3/8 in. (34mm) minimum mill option hardwood.
  5. Crossbands: Full width of door with grain running horizontally, tapeless spliced without voids.
  6. Face Veneer: As specified, laminated to crossband and edges.
  7. Bonding
    - a. Core to stiles, rails and blocking utilizing adhesive; sand prior to assembly of face veneers.
    - b. Face veneers and crossbands to core and edges utilizing adhesive by hot plate process.
- C. Fabrication Tolerances: Comply with WDMA Industry Standard I.S.1A and I.S.6A, AWS Section 9, and the following.
1. Jambs: 1/8 in. (3mm) each jamb. Lock edge beveled 1/8 in. (3mm) in 2 in. (50mm).
  2. Head: 1/8 in. (3mm).
  3. Sill: Cut at time of installation except for labeled doors that must be machined under label service. Do not exceed clearance as required to meet labeling requirements.

## **2.5 DOOR TYPES**

- A. Medium Density Overlay: Doors to receive medium density overlay face veneers for painted finish or pre-priming or to receive plastic laminate face veneers shall be Type I Fabrication.
- B. Hardwood Face Veneers: Doors to receive hardwood face veneers for natural finish (conversion varnish or thermoplastic film) or to receive high density overlay face veneers for polyvinyl fluoride film finish shall be Type I Fabrication.
- C. Exterior Doors: Doors to be installed on exterior of building, subjected to weather or containing 75% glazing, to be Type II Fabrication.
- D. Fire Rated Doors: Doors of the hourly ratings shown shall be Type III Fabrication. Face veneers and finishes shall match adjacent non-rated doors.

- E. Acoustical Doors: Doors to be acoustically rated shall be Type IV Fabrication. Face veneers and finishes shall match adjacent non-rated doors. Provide acoustical doors constructed to achieve a sound transmission class (STC) of 39 +/-1 in accordance with ASTM E90 for each door when installed. Unit shall be provided complete with necessary gasketing and sound seals to achieve the rating. Doors shall be designed for use with standard builders' hardware as scheduled and be provided with minimum 3 in. (75mm) (after fitting) deep top rails. Through bolting of hardware on acoustical doors shall not be permitted. Provide one of the following:

1. "Algoma Made Acoustical Door - STC 40" (Algoma).
2. "Acoustical STC 40" (Eggers).

## **2.6 DOOR LOUVERS**

- A. Fabrication: Where shown or scheduled, provide minimum 20 gauge (0.9mm) steel louvers of type indicated complete with frame and factory applied baked enamel finish matching door finish. Where noted or where required for fire rating by codes or by authorities having jurisdiction, provide louvers with operable blades and fusible links. Refer to mechanical and architectural Drawings for size and location of louvers. Provide adequate blocking for louver openings in Type III Fabrication. Fasten frames through door by countersunk Phillips machine screws.

## **2.7 PREFITTING AND PREMACHINING**

- A. Tolerances: Prefit doors and panels in accordance with tolerance requirements of Commercial Standard CS 171 and AWS Section 9, at the place of manufacture. Provide standard bevel or radius to edges of doors as required by the installation.
- B. Machining: Machine doors and panels for hardware requiring cutting of the doors at the place of manufacture. Accurately cut, drill, mortise, rout, and otherwise specially prepare doors by machine as required for proper installation of hardware and door accessories. Machining shall be in accordance with hardware templates, final hardware schedules and door frame shop drawings. Take accurate field measurements of hardware mortises in metal frames to verify dimensions and alignment before proceeding with premachining.

## **2.8 PRE-PRIMING**

- A. Priming: Prime door faces, edges and cutouts with one (1) shop coat primer specified, at the place of manufacture. Surfaces shall be clean and dry before priming. Apply primer uniformly without runs, sags or bare spots to a dry film thickness of 1 mil (0.025mm).

## **2.9 SHOP FINISHING**

- A. General: Comply with applicable provisions and requirements of AWS Section 9, Factory Finishing, Premium Grade. Apply complete finishes in fabricator's shop.
- B. Conversion Varnish: Natural veneer doors shall be finished with a conversion varnish to a cured film thickness of 1 mil (0.025mm) and complying with MIL-V-12954 and AWS Section 9, Premium Grade, at the place of manufacture. Prior to application of finish prepare door faces with oil stains or toners as required to match Architect's sample. Apply a compatible finish to stile and rail edges and cutouts.

- C. Thermoplastic Film: Prefinished natural veneer doors shall be finished with a 3 mil thick thermoplastic film bonded under heat pressure at the place of manufacture. Prior to application of finish prepare door faces with pigments or toners as required to match Architect's samples. Specular gloss of film shall be as selected by the Architect. Apply a compatible finish to stile and rail edges and cutouts.
- D. Painted Doors: Painted doors shall be finished with an opaque pigmented conversion varnish or UV-curable acrylated epoxy/polyester/urethane, to a cured film thickness of 1 mil (0.025mm) and complying AWS Section 9, Premium Grade at the place of manufacture. Color and specular gloss shall be as selected by the Architect. Paint stile and rail edges and cutouts.

### **PART 3 - EXECUTION**

#### **3.1 GENERAL**

- A. Manufacturer's Instructions: Prepare substrates, and install the work of this Section, including components and accessories in accordance with the manufacturer's instructions, except where more stringent requirements are shown or specified, and where project conditions require extra precautions or provisions to ensure satisfactory performance of the Work.

#### **3.2 EXAMINATION**

- A. Verification of Conditions: Examine the areas to receive the Work and the conditions under which the Work would be performed. Contractor shall remedy conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected. Do not hang doors with an apparent defect.

#### **3.3 PREPARATION**

- B. Substrate Acceptability: Commencement of installation shall constitute acceptance of substrate conditions by the Installer.
- C. Conditions: Do not install doors until concrete, masonry, plaster, tile and terrazzo work are completed and dried in the areas to receive doors. Doors shall be conditioned to the average prevailing moisture (humidity) of the locality before hanging. Doors shall not be subjected to abnormal heat, dryness, or humidity. Avoid sudden changes such as forced heat (used to dry out the building).
- D. Cutting and Trimming: Cutting, trimming, fitting and machining of prefinished doors will not be permitted.

#### **3.4 INSTALLATION**

- E. Clearances
  - 1. Clearances for Non-Rated Doors: Provide 1/8 in. (3mm) at jambs and heads; 1/16 in. (1.5mm) per leaf at meeting stiles for pairs of doors; and 1/8 in. (3mm) from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4 in. (6mm) clearance from bottom of door to

top of threshold. Bevel non-rated doors 1/8 in. (3mm) in 2 in. (50mm) at lock and hinge edges.

2. Clearances for Fire-Rated Doors: Comply with NFPA 80. Bevel fire-rated doors 1/8 in. (3mm) in 2 in. (50mm) at lock edge; trim stiles and rails only to extent permitted by labeling agency.
  3. Clearances for Acoustically Rated Doors: Comply with manufacturer's strict installation instructions as required to maintain acoustical rating required.
- F. Installation: Install doors in required openings as shown. Install flush panels with concealed fasteners. Provide pilot holes of proper size for screws into particle board core doors. Use stainless steel sheet metal screws into particle board.
1. Install fire-rated doors in corresponding fire-rated frames in accordance with requirements of the UL Label, NFPA No. 80 and local authorities having jurisdiction.
- G. Hardware Installation: Apply hardware in accordance with hardware manufacturer's instructions and Section 08 70 00 "Hardware". Adjust door installation to provide uniform clearance at head and jambs, and to contact stops uniformly. Remove and replace doors which are found to be warped, bowed, do not swing or operate freely or otherwise damaged and cannot be properly fitted in frames.

### **3.5 ADJUSTING**

- A. Operation: Re-hang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

### **3.6 CLEANING**

- A. Upon completion of installation, clean exposed surfaces as recommended by manufacturer.

### **3.7 PROTECTION**

- A. Protection: Protect doors and hardware during construction. Marred finishes shall be touched-up to perfectly match adjacent surfaces to the satisfaction of the Architect or unit shall be replaced.

**END OF SECTION**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. General: Provide access doors and panels in accordance with requirements of the Contract Documents.
- B. Related Work Specified Elsewhere:
  - 1. Section 01 81 13 "Sustainable Design Requirements" for additional references, definitions, documentation requirements, action plans, meetings, and performance requirements of products and systems.
  - 2. Finish painting of factory prime painted access doors and frames is specified in Section 09 91 00 "Painting".
  - 3. Finishes scheduled for installation in recessed pan-type access doors is specified in various Division 9 specification sections.

**1.2 REFERENCES**

- A. General: Comply with the applicable provisions of the referenced standards except as modified by governing codes and the Contract Documents. Where a recommendation or suggestion occurs in the referenced standards, such recommendation or suggestion shall be considered mandatory. In the event of conflict between referenced standards, this specification or within themselves, the more stringent standard or requirement shall govern.
- B. American Welding Society (AWS)
  - 1. AWS D1.1 "Structural Welding Code - Steel".
  - 2. AWS D1.2 "Structural Welding Code - Aluminum".
  - 3. AWS D1.3 "Structural Welding Code - Sheet Steel".
- C. Industrial Fasteners Institute (IFI): "Fastener Standards Book."
- D. National Association of Architectural Metal Manufacturers (NAAMM): NAAMM "Metal Finishes Manual".
- E. Underwriters Laboratories Inc. (UL): UL 263, "Standard for Fire Tests of Building Construction and Materials".

**1.3 SYSTEM DESCRIPTION**

- A. Performance Requirements
  - 1. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics according to the following test method and that are listed and



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labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction: Comply with the following:

- a. NFPA 252 or UL 10B for fire-rated access door assemblies installed vertically.
- b. NFPA 288 for fire-rated access door assemblies installed horizontally.

**1.4 SUBMITTALS**

- A. Product Data: Submit for Architect's action. Submit manufacturer's technical literature, specifications and installation instructions describing the general properties of each material and accessory to be used in the Work for each type of access door and panel assembly, including instructions, and directions for installation of anchorage devices. Include maintenance instructions for doors with exposed factory finishes.
- B. Shop Drawings: Submit for Architect's action. Submit shop drawings for the fabrication and installation of the Work including details of each frame type, elevations of door design types, anchorage and accessory items. Prepare details at not less than 3 in. = 1 ft. (1:5) minimum scale.
  - 1. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items with concealed framing, suspension systems, piping, ductwork, and other construction. Show the following:
    - a. Method of attaching door frames to surrounding construction.
    - b. Ceiling-mounted items including access doors and frames, lighting fixtures, diffusers, grilles, speakers, sprinklers, and special trim.
- C. Samples: Submit samples for Architect's action. Label samples to indicate product, characteristics, and location in the Work. Samples will be reviewed for color and appearance only. Furnish sufficient samples to establish the full range of colors and textures for materials exposed in the finished work. Compliance with other requirements is the responsibility of the Contractor. Provide sample for each access door face material, at least 3 in. (75mm) x 5 in. (125mm) in size, in specified finish.
- D. Access Door and Panel Schedule: Submit, for Architect's information, complete access door and panel schedule, including types, ratings, general locations, sizes, wall and ceiling construction details, finishes, latching or locking provisions, and other data pertinent to installation. Provide access doors and panels at locations where access is required for maintenance.
- E. Quality Control Submittals: Submit for Architect's information.
  - 1. Certificates
    - a. Document Review: Before commencing work, submit a written statement signed by the Contractor and the Applicator certifying that the Contract Documents, shop drawings and product data have been reviewed with material manufacturers' qualified technical representatives and that they agree the selected materials are proper, compatible with contiguous materials and adequate for the application shown.



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2. Installer's Qualifications: Evidence of successful completion of work of similar scope to that shown and specified for this Project.
  3. Manufacturer's Qualifications: Evidence that the specified materials have been manufactured by the same source and successfully utilized for a minimum of 5 years on projects of a similar scope to that shown and specified for this Project.
- F. Closeout Submittals: Submit, for Owner's documentation.
1. Maintenance Manuals: Describing the materials, and procedures for cleaning and maintaining each type of access door. Include manufacturer's data describing the materials and finishes used in the work.

**1.5 QUALITY ASSURANCE**

- A. Qualified Installer: The access doors and panels work shall be performed by an installer having 5 years experience in the installation of specified materials on comparable projects. The installer shall have the approval of the access doors and panels manufacturer.
- B. Manufacturer Qualifications: Provide access doors and panels manufactured by a manufacturer specializing in the production of access door work for not less than 5 years. Fabricate access doors and panels as a single integral unit with frame, anchors, hardware, accessory parts, fittings and fastenings. Units are to be the standard products, or modifications if required, of one of the listed manufacturers.
1. Single-Source Responsibility: Obtain each type of access door or panel for the entire project through one source from a single manufacturer.
  2. Size Variations: Obtain Architect's acceptance of manufacturer's standard size units, which may vary slightly from sizes indicated.
- C. Verification: Obtain specific locations and sizes for required access doors and panels from trades requiring access to concealed equipment, and indicate on access door schedule submittal.
- D. Requirements of Regulatory Agencies: Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from authorities having jurisdiction.
1. Fire-Resistance Ratings: Wherever a fire-resistance rating is shown for construction into which access doors and panels are to be installed, provide an access door assembly (door, frame, hinge, and lock or latch) of type and manufacturer listed by Underwriter's Laboratories, "Classified Building Materials Index". Provide access doors and panels, UL rated 1-1/2 hour for 2 hour partition, Class "B" with a temperature rise rating of 250 deg. F (121 deg. C.) maximum in 30 minutes of fire exposure. Provide UL label on each fire-resistance rated access door assembly.

**1.6 DELIVERY STORAGE AND HANDLING**

- A. General: Store access door and panel items and accessories under cover and off the ground. Handle in such a manner so as to protect surfaces and to prevent distortion of, and other type of damage to, fabricated pieces.



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**1.7 WARRANTY**

- A. Warranties and guaranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and are in addition to and run concurrent with other warranties and guaranties made by the Contractor under requirements of the Contract Documents.
- B. Special Fire Rated Floor Access Door Warranty: Provide a written warranty for a period of five (5) years, warranting that the fire rated floor access door will be free of defects in material or workmanship during the warranty period. Warranty shall be signed by the Contractor and the firm awarded the work. Upon notification of such defect, within the warranty period, make the necessary repairs at the convenience of the Owner.

**PART 2 - PRODUCTS**

**2.1 MATERIALS, GENERAL**

- A. Metal Surfaces, General: For fabrication of access door and panel metal work which will be exposed to view in the finished work, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating, and applying surface finishes.
- B. Galvanized Carbon Steel Sheets: ASTM A653 (A653M), hot-dip galvanized with G90 (Z275) coating (minimum spangle), either commercial quality or structural quality, Grade 33, unless another grade is required for design loads.
- C. Cold Rolled Carbon Steel Sheets: ASTM A366 (A366M); commercial quality, stretcher leveled, free from scale, pitting or other defects.
- D. Steel Angles, Plates, Bars, Rods and Other Steel Accessories: ASTM A36.
- E. Stainless Steel: ASTM A240 (A240M); Provide the most suitable austenitic alloy, form and finish required to produce the Work. Provide Type 304 or Type 316 and low carbon Type 304L or 316L for components to be welded, unless otherwise noted.
  - 1. Plate and Sheet: ASTM A480 (A480M). Stretcher level sheets.
  - 2. Bar Stock and Shapes: ASTM A276.
- F. Aluminum: Provide alloy and temper recommended by aluminum producer or finisher for type of use and finish specified or shown, and with not less than the strength and durability properties of the alloy and temper designated below for each aluminum form required.
  - 1. Extruded Bar and Shapes: ASTM B221 (B221M), 6063-T6.
  - 2. Plate and Sheet: ASTM B209 (B209M), 6061-T6.
- G. Fasteners and Anchorage Devices: Provide fasteners complying with the requirements of Industrial Fasteners Institute standards. Type, grade, class and style best suited for the respective purpose. Use countersunk flat-head Phillips type machine screws for exposed fasteners, except where Allen head screws are required. Use galvanized steel or



stainless steel fasteners for exterior construction and for fastening components fabricated of galvanized steel.

1. Provide Type 304 or Type 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, where built into exterior walls and fastening components fabricated of galvanized steel.

**H. Finishes**

1. Ferrous Metal Finish: Chemically bonded with prime coat of baked-on electrostatically applied primer.
2. Stainless Steel: No. 4 (bright directional polish) unless otherwise shown or specified.
3. Aluminum Finishes: Finish designations prefixed by "AA" conform to the system established by the Aluminum Association for designating aluminum finishes. Provide as fabricated finish: AA-M10; (Mechanical Finish as fabricated, unspecified) unless otherwise shown or specified.

**2.2 FABRICATION, GENERAL**

- A. General: Provide each access door assembly manufactured as an integral unit, complete with components, accessories and fasteners ready for installation.
- B. Forming: Form exposed surfaces free from warp, wave and buckle, with corners square, unless otherwise shown. Form molded members straight and true, with welded joints coped or mitered, well formed, and in true alignment. Dress welded joints on exposed surfaces smooth so they are invisible after finishing and flush with adjacent surfaces. Provide attachment devices and fasteners of type required to secure access doors and frames to contiguous support construction.
- C. Reinforcing: Reinforce members and joints with structural shapes and plates in concealed locations, as necessary for adequate strength and rigidity. Provide concealed fastenings unless otherwise shown. Locate necessary exposed fastenings in an orderly pattern, in accordance with reviewed shop drawings. Separate dissimilar metals with dielectric separator to prevent galvanic action. Do not extend coatings onto exposed surfaces
- D. Locations: Access doors, panels, related frames and accessories to be located in exterior areas, areas of high humidity or other locations noted, shall be hot dip galvanized and finish painted. Factory prime mild steel not galvanized. Access doors and panels exposed to public view shall be finish painted in color(s) as selected by the Architect.
- E. Locking Devices: Provide locking devices for access doors and panels in sufficient number for the size door to be installed. Provide six extra keys for keyed locks and masterkey locks for the entire project unless otherwise indicated or specified.
- F. Strippable Protection: Prior to shipment protect finishes on exposed surfaces from damage by application of strippable temporary protective covering or other means.



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**2.3 FABRICATION, ACCESS DOORS AND PANELS**

- A. Flush Access Panel for Installation in Masonry Substrates (AP-1)
1. Features: Frame shall be 16 gauge (1.5mm) steel with a nominal 1 in. (25mm) exposed frame flange. Door shall be 14 gauge (1.9mm) steel, fitted flush with frame flange. Reinforce access doors over 24 in. (600mm) in width to prevent sagging. Provide galvanized steel anchors appropriate for substrate. Provide concealed spring hinges permitting 175° opening. Provide flush screwdriver operated cam locks for access doors except provide flush key operated cylinder locks for access doors in public areas.
  2. Provide one of the following:
    - a. "Style TM" (J. L. Industries).
    - b. "Type DSC-214M" (Karp Associates Inc.).
    - c. "Style M" (Milcor).
    - d. "NT Series" (Nystrom, Inc.).
- B. Stainless Steel Flush Access Panel for Installation in Masonry and Ceramic Tile Substrates (AP-2)
1. Features: Frame shall be 16 gauge (1.5mm) stainless steel with a nominal 1 in. (25mm) exposed frame flange. Door shall be 14 gauge (1.9mm) stainless steel, fitted flush with frame flange. Reinforce access doors over 24 in. (600mm) in width to prevent sagging. Provide galvanized steel anchors appropriate for substrate. Provide concealed spring hinges permitting 175° opening. Provide flush key operated stainless steel cylinder locks.
  2. Provide one of the following:
    - a. "Style TMS" (J. L. Industries).
    - b. "Type DSC-214M Stainless Steel" (Karp Associates, Inc.).
    - c. "Style MS" (Milcor).
    - d. "NT Series Stainless Steel" (Nystrom, Inc.).
- C. Flush Access Panel for Installation in Gypsum Board Substrates (AP-3)
1. Features: Frame shall be 16 gauge (1.5mm) steel with an integral galvanized steel drywall bead. Door shall be 14 gauge (1.9mm) steel, fitted flush with 22 gauge (0.85mm) galvanized steel integral gypsum board bead. Provide concealed spring hinges permitting 175° opening. Provide flush screwdriver operated cam locks for access doors, except provide flush key operated cylinder locks for access doors in public areas.
  2. Provide one of the following:
    - a. "Style WB" (J. L. Industries).

- b. "Type KDW" (Karp Associates, Inc.).
- c. "Style DW" (Milcor).
- d. "NW Series" (Nystrom, Inc.).

**D. Recessed Pan-Type Access Panel for Installation in Plaster Substrates (AP-4)**

- 1. Features: 1 in. (25mm) deep recessed mounting flange shall be 16 gauge (1.5mm) steel with an integral 3 in. (75mm) galvanized self-furring steel lath. Door shall be 16 gauge (1.5mm) steel, recessed and lined with spot welded self-furring galvanized steel lath. Provide concealed pivoting rod type hinges permitting 175° opening and flush key operated stainless steel cam locks with automatic dust shutters and welded sleeves.
- 2. Provide one of the following:
  - a. "AP-5010" (Acudor Access Doors).
  - b. "Type DSC-210PL" (Karp Associates, Inc.).
  - c. "RP Series" (Nystrom, Inc.).

**E. Exterior Insulated Pan Type Access Panel (AP-5)**

- 1. Features: Fabricate door with a 0.060 in. (1.5mm) thick aluminum sheet, an extruded aluminum frame and a stainless steel continuous piano hinge. Provide 2 in. (50mm) of fiberglass insulation and two dual acting handles.
- 2. Provide one of the following:
  - a. "XT Series" (Nystrom Inc).
  - b. "MX Exterior Door" (Karp Associates, Inc.).

**2.4 FABRICATION, FIRE RATED DOORS**

- A. General: Construct doors and frames to comply with the requirements of the NFPA and Underwriters' Laboratories, Inc. for "B" Label, 1-1/2 hour rating. Install UL label on each door in a non-exposed location unless otherwise required by the local authority having jurisdiction.
- B. Fire Rated Steel Access Door
  - 1. Features: Frame shall be 16 gauge (1.5mm) steel with a nominal 1 in. (25mm) frame flange and integral appropriate anchors. Door shall be 2 in. (50mm) thick, fabricated of 20 gauge (0.9mm) steel face sheets, sandwich construction, with a non-combustible insulation core. Provide continuous stainless steel piano type hinge with stainless steel pin for the length of the door and an automatic latching device with operating turn ring (flush key operated cylinder lock in public areas) and interior latch release. Provide an automatic spring door closer for doors.



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2. Manufacturer:
  - a. "Style FD" (J. L. Industries).
  - b. "Type KRP-150FR" (Karp Associates, Inc.).
  - c. "IT Series" (Nystrom, Inc.).
- C. Fire Rated Stainless Steel Access Door
  1. Features: Frame shall be 16 gauge (1.5mm) stainless steel with a nominal 1 in. (25mm) frame flange and integral appropriate anchors. Door shall be 2 in. (50mm) thick, fabricated of 20 gauge (0.9mm) stainless steel face sheets, sandwich construction, with a non-combustible insulation core. Provide continuous stainless steel piano type hinge with stainless steel pin for the length of the door and an automatic latching device with flush key operated stainless steel cylinder lock and interior latch release. Provide an automatic spring door closer for doors.
  2. Manufacturer:
    - a. "Style FDSS Stainless Steel" (J. L. Industries).
    - b. "Type KRP-150FR Stainless Steel" (Karp Associates, Inc.).
    - c. "IT Series, Stainless Steel" (Nystrom, Inc.).

**PART 3 - EXECUTION**

**3.1 GENERAL**

- A. Manufacturer's Instructions: Prepare substrates and install the work of this Section, including components, and accessories in accordance with the manufacturer's instructions, except where more stringent requirements are shown or specified, and where project conditions require extra precautions or provisions to ensure satisfactory performance of the Work.

**3.2 EXAMINATION**

- A. Verification of Conditions: Examine the areas to receive the Work and the conditions under which the Work would be performed. Contractor shall remedy conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected. Do not hang doors with an apparent defect.

**3.3 PREPARATION**

- A. Substrate Acceptability: Commencement of installation shall constitute acceptance of substrate conditions by the Installer.

**3.4 INSTALLATION**

- A. Verification of Dimensions: Verify dimensions of openings by field measurements so that access doors and related items will be accurately designed, fabricated and fitted to the

substrate.

- B. Coordination: Coordinate access doors and panels with the work of other Sections and provide items to be placed during the installation of other work. Coordinate delivery of such items to the project site. Deliver items which are to be built into the work of other Sections in time so as not to delay the progress of the Work.
- C. Installation: Install access doors and panels in locations shown, plumb, level and in line with adjacent materials where required. Provide fastenings as indicated on the final shop drawings. Fit exposed connections accurately together to form tight hairline joints. Adjust hardware and doors for proper operation.
- D. Installation of Floor Access Doors and Fire Rated Floor Access Doors: Install fire rated items in a manner which will not comprise the ratings of the substrate where installation is scheduled.

### **3.5 ADJUSTING**

- A. Touch-Up: Paint and touch-up paint with the specified paint system. Touch up galvanized surfaces in accordance with ASTM A780.
- B. Adjustment: Adjust doors and hardware after installation for proper operation.
- C. Damaged Doors and Panels: Remove and replace doors, panels, and frames that are warped, bowed, or otherwise damaged.

### **3.6 CLEANING**

- A. Cleaning: Clean surfaces and leave free from smears. Repair minor scratches and other finish imperfections. Immediately after erection, clean field welds, bolted connections, marred and abraded surfaces. Remove and replace panels or frames that are warped, bowed, or otherwise damaged.

### **3.7 PROTECTION**

- A. Protection: Protect finished surfaces against damage during construction and remove protection at time of substantial completion.

**END OF SECTION**

**SECTION 08 41 00  
ENTRANCES AND STOREFRONTS**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. General: Provide entrances and storefronts, in accordance with the Contract Documents.
- B. The Work of this Section includes, but is not limited to the following:
  - 1. Swing doors.
  - 2. Storefront and transoms.
- C. Related Work Specified Elsewhere:
  - 1. Section 01 81 13 "Sustainable Design Requirements" for additional references, definitions, documentation requirements, action plans, meetings, and performance requirements of products and systems.
  - 2. Insulation is specified in Section 07 23 00 "Building Insulation".
  - 3. Sealants and joint fillers installed at interface of entrance assemblies and other building components are specified under Section 07 92 00 "Joint Sealants".
  - 4. Other than hardware specified as part of entrance assemblies, finish hardware and cylinders is furnished under Section 08 70 00 "Hardware" and installed under this section.
  - 5. Glass and glazing other than for pre glazed doors and frames is specified in Section 08 80 00 "Glazing".
  - 6. Electrical wiring and controls are specified in Division 26 Electrical Sections.

**1.02 REFERENCES**

- A. General: Comply with the applicable provisions of the referenced standards except as modified by governing codes and the Contract Documents. Where a recommendation or suggestion occurs in the referenced standards, such recommendation or suggestion shall be considered mandatory. In the event of conflict between referenced standards, this specification or within themselves, the more stringent standard or requirement shall govern.
- B. Aluminum Association (AA)
  - 1. Aluminum Standards and Data
  - 2. Designation System for Aluminum Finishes
  - 3. Engineering Data for Aluminum Structures
- C. ADA/ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disability Act"(ADA) and Architectural Barriers Act

(ABA) "Accessibility Guidelines for Buildings and Facilities".

- D. American Architectural Manufacturers Association (AAMA)
  - 1. AAMA "Aluminum Storefront and Entrance Manual".
  - 2. AAMA 2603 "Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Extruded Aluminum and Panels".
  - 3. AAMA 2605 "Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Architectural Extrusions and Panels".
- E. American Institute of Steel Construction (AISC): AISC "Code of Standard Practice for Steel Buildings and Bridges".
- F. American Welding Society AWS
  - 1. AWS D1.1 "Structural Welding Code - Steel".
  - 2. AWS D1.2 "Structural Welding Code - Aluminum".
  - 3. AWS D1.3 "Structural Welding Code - Sheet Steel".
  - 4. AWS D1.6 "Structural Welding Code – Stainless Steel."
- G. ASTM International (ASTM): ASTM C1401 "Standard Guide for Structural Sealant Glazing".
- H. Copper Development Association (CDA): CDA Publication No. 120/2 "Welding, Soldering, Brazing and Surfacing of Copper and Copper Alloys".
- I. National Association of Architectural Metal Manufacturers (NAAMM): NAAMM "Metal Finishes Manual".

### **1.3 SYSTEM DESCRIPTION**

- A. System Description: The entrance and storefront system as described herein is that portion of the facade that comprises materials, components and assemblies between the internal and the external surfaces at the entrance level which shall be considered a complete system providing a high quality, watertight, airtight and structurally sound entrance and storefront enclosure to the specified standards. The work of this Section includes, but is not limited to, the following:
  - 1. Aluminum metal entrance and storefront components including finish coatings.
    - a. Swing doors complete with glass, glazing, weatherstripping and scheduled hardware.
    - b. Metal and glass storefronts complete with glass and glazing.
  - 2. Aluminum trim as may be necessary to join adjoining materials to the metal and glass assemblies including finish coatings.

3. Glass and glazing accessories associated with the entrance and storefront enclosure
4. Aluminum panels in designated portions of the entrance and storefront assemblies including finish coatings.
5. Reinforcing (stiffeners, brackets, etc.) required to strengthen or reinforce members that are not specifically called out as structural steel or miscellaneous metal fabrications.
6. Sealants, joint fillers, gaskets, etc. necessary to produce a watertight installation including sealants and joint fillers at the junction of the entrance and storefront metal and glass elements and contiguous facade components.
7. Weeps, baffles, thermal breaks, flashings, etc. necessary to meet performance requirements.
8. Anchors, inserts, embedded devices, etc. necessary to support the entrance and storefront system. This shall include but not be limited to design, engineering, coordination, manufacture, supply, layout, field checking, installation and any necessary repair of the fixing anchors and their attachment to the embedded anchorage and the anchorage embeds.
9. Coordination with other trade contractors that have components of their work installed on or within the entrance and storefront system.
10. Shop drawings, structural calculations, manufacturer's data, certifications of compliance and selected samples of materials and warranties pertaining to the entrance and storefront enclosure.
11. Field measurements of adjacent and/or supporting construction and verification of existing conditions.
12. Field testing of assemblies for water penetration.
13. Protection and cleaning of finished work.
14. Participation in coordination meetings throughout the course of the Work.
15. Preparation of "as-built" shop drawings reflecting changes (from original "approved" shop drawings) that may have occurred during the course of the work.

**B. Performance Requirements**

1. Wind Loading Requirements: Design, fabricate and install component parts so that the completed entrances and storefronts will withstand the inward and outward pressures normal to the plane of the wall as shown by "Wind Pressure Diagrams" on Drawings. At corners and other changes in plane, both surfaces shall be assumed to experience the most severe combinations of negative and positive pressures simultaneously. Incorporate within entrance and storefront design loadings induced by overhanging elements.



2. Wind Loading Requirements: Design, fabricate and install entrances and storefronts so that the total, installed units will withstand an inward and outward pressure required by code normal to the plane of the wall. At corners and other changes in plane, both surfaces shall be assumed to experience the most severe combinations of negative and positive pressures simultaneously. Incorporate within entrance and storefront design loadings induced by overhanging elements.
3. Building Movement: Design, fabricate and install entrance and storefront assemblies to withstand building movements including loading deflections, shrinkage, creep, design displacement of adjacent stories, seismic and similar movements. Building movement shall be accommodated by interlocking aluminum components not through slippage of glass relative to framing members.
4. Deflections: Maximum full load deflections, normal to the entrance and storefront wall plane for any member, shall not exceed 75% of the design clearance dimension between that member and the panel, glass or other part immediately adjacent. Submit engineering calculations to show maximum deflections based on full panel loads, uniformly distributed, building deflections, thermal stresses, and erection tolerances. Glass, sealants and interior finishes shall not be included to contribute to framing member strength, stiffness or lateral stability. Limit vertical deflection of glazing framing system so as to prevent ponding of water within the glazing rabbet. Deflection of any member under 1.5 times design wind load shall not result in sealant failure. Splice joints which permit thermal and other movements by slippage within the joint shall be assumed to have zero moment capacity. Maximum full load deflections, normal to the entrance and storefront wall plane, for any wall member or component shall not exceed the following:
  - a. Storefronts and Entrances:
    - 1) L/175 of its clear span of the component part or 3/4 in. (19mm), whichever is less for spans up to 15 ft. (4.5m), except limit the maximum center deflection of glass to 1 in. (25mm) and deflection of the entire assembly including glass to 1-1/2 in. (38mm).
    - 2) L/240 of its clear span of the component part or 1-1/2 in. (38mm), whichever is less for spans between 15 ft. (4.5m) and 40 ft. (12m), except limit the maximum center deflection of glass to 1 in. (25mm) and deflection of the entire assembly including glass to 2 in. (50mm).
    - 3) Deflection of cantilevered elements at full design wind pressure (e.g., framing members overhanging anchor points), if any, shall not exceed 1% of the cantilever length or 3/4 in. (19mm), whichever is less.
  - b. Metal Panels, Fascias, Metal Covers or Other Fabricated Metal Items: L/120 of its clear span or 3/4 in (19mm) whichever is less. Deflection shall be measured relative to the horizontal and vertical support members with the allowable deflection being determined by the lesser dimension.



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5. Deformation: Permanent deformation, disengagement or breakage of frame members and weld or fastener damage or failure shall not occur under loading equal to 1.5 times the design load pressures, positive or negative. Permanent deformation is defined as deflection without recovery exceeding length/1000.
6. Anchorage Disengagement: Anchorage disengagement or breakage shall not occur when an installed unit is subjected to a force equal to 2.5 times the design load.
7. Temperature Requirements: Design, fabricate and install component parts to provide for expansion and contraction of the exterior wall over an ambient exterior temperature range and exterior metal surface temperature of -10 deg. F. (-23 deg. C.) through +180 deg. F. (82 deg. C.); an interior temperature range of +55 deg. F. (13 deg. C.) to 100 deg. F. (38 deg. C.) without buckling, sealed joint failure, glass breakage, undue stress on members or anchors, and other detrimental effects.
8. Pressure Equalized System: Design, fabricate and install component parts employing the pressure equalized rain screen principle; providing a completely impervious air and vapor barrier.
9. Air and Water Control: Design, fabricate and install entrance and storefront systems and components to provide a completely impervious air and vapor barrier. Provide tight joints and effectively seal exterior units and panels against water leakage and air infiltration. Water leakage is defined as the appearance of uncontrolled water, other than condensation, on inboard part of door, frame or panel, under actual weather conditions. Uncontrolled water is defined as leakage that is not contained and/or drained away in a manner as to cause no damage to the wall or adjacent construction of finishes.
  - a. Compliance: Provide entrance doors with jamb and head frames which comply with requirements indicated below for transmission characteristics and test methods
  - b. Metal Framed Glass Swing Door Air Leakage: Air infiltration per linear foot of perimeter crack of not more than 0.50 cfm (0.024 L/s) for single doors and 1.0 cfm (0.047 L/s) for pairs of doors as per ASTM E283 at pressure differential of 1.567 psf (0.07kPa).
  - c. Storefront and Transom Air Leakage: Air infiltrations for storefront and transoms shall not exceed 0.06 cfm/ft.<sup>2</sup> (0.30 L/s/m<sup>2</sup>) of wall area when tested at 6.24 psf (0.30 kPa) test pressure.
10. Structural Sealant Glazed Storefront and Transom System: Provide structural silicone sealant glazed storefront and transom system that withstands tensile and shear stresses imposed by system without failing adhesively or cohesively. Provide structural sealant glazed storefront system that has the following capabilities based on preconstruction testing:
  - a. Withstands loads and thermal and structural movement requirements indicated without failure. Failure includes the following:
    - 1) Air infiltration and water penetration exceeding specified limits.

- 2) Framing members transferring stresses, including those caused by thermal and structural movement, to glazing units. (Structural silicone sealant shall not carry gravity load of glazing.)
- b. Glazing is physically and thermally isolated from framing members and glazing-to-glazing joints accommodate thermal and mechanical movements of glazing and system, prevent glazing-to-glazing contact, and maintain required edge clearances. Structural silicone sealant shall not carry gravity load of glazing.
- c. Tensile or shear stress in structural silicone sealant joints is less than 20 psi (138 kPa) with a safety factor of 5:1 and structural silicone sealant does not carry gravity load of glazing.
- d. Provide structural sealant glazed storefront system and transom members that do not deflect an amount which will reduce glazing bite below 75 % of design dimension when carrying full dead load. Provide a minimum 1/8 in. (3mm) clearance between members and top of fixed panels, glazing, or other fixed part immediately below. Provide a minimum 1/16 in. (1.5mm) clearance between members and operable windows and doors.
- e. Provide structural sealant glazed storefront and transom system, including anchorage, that accommodates supporting structure's deflection from uniformly distributed and concentrated live loads indicated and that accommodates structural movements including, but not limited to, sway, twist, column shortening, long-term creep, and deflection without failure of materials or permanent deformation.
- f. Provide structural sealant glazed storefront and transom system, including anchorage, capable of withstanding the effects of earthquake motions calculated according to requirements of authorities having jurisdiction and as specified herein.
- g. Provide sealant that fails cohesively before sealant releases from substrate when tested for adhesive compatibility with each substrate and joint condition required. Adhesive failure occurs when sealant pulls away from a substrate cleanly, leaving no sealant material behind. Cohesive failure occurs when sealant breaks or tears within a joint but does not separate from each substrate because sealant-to-substrate bond strength exceeds sealant's internal strength.
- h. Provide only neutral cure structural silicone as manufactured by Dow Corning Corporation or Momentive Performance Materials. Do not utilize high modulus structural silicone as a weatherseal in any application.
11. Traffic: Design and fabricate entrances, storefronts, and transoms to withstand the operating loads which result from heavy traffic conditions using the specified hardware, without measurable permanent deflection. Limit elastic deflections so as to provide the normal degree of rigidity required to avoid glass breakage, air leaks and other objectionable results of excessive flexibility.
12. Swing Door Requirements: Design, fabricate and install swing doors that are sufficient to carry weight of doors and imposed operational loads on doors.



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Provide hardware for swing doors that comply with the following:

- a. Opening Force:
    - 1) Exterior and Egress Doors: Not more than 15 lbf (67N) to release the latch and not more than 30 lbf (133N) to set the door in motion and open the door to its minimum width and not more than 5 lbf (22N) to fully open door for scheduled ADA accessible doors.
    - 2) Accessible Interior Doors: Not more than 5 lbf (22N) to fully open door for scheduled ADA accessible interior doors.
  - b. Delayed-Action Closing: Comply with requirements of authorities having jurisdiction or the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), and Architectural Barriers Act (ABA) "Accessibility Guidelines for Buildings and Facilities," whichever are more stringent.
13. Thermal Transmittance: Provide storefront and transom framing which shall result in a "U" value not to exceed 0.69 when tested in accordance with ASTM C1363 utilizing a guarded hot box.
14. Seismic Displacement: Design to withstand minimum lateral relative displacements between adjacent floors with typical story height shown and as follows:
- a. Elastic Drift: 3/4 inches (20 mm) in typical story height. Units shall have no structural failure or deterioration, no sealant failure, no permanent deformation of metal components. Units shall not make contact with adjacent panels or with the structural frame. Units and connections shall remain essentially elastic under the action of these deformations.
  - b. Design Drift: 3/8 inches (10 mm) in typical story height. Units and connections shall have no structural failure. Provide units and connections with no falling hazards possible. Cladding units shall have no breakage. Sealant failures (excluding structural silicone), gasket disengagement, and minor deformation of connections and metal framing section may be expected. Cladding units shall not make contact with adjacent panels or with the structural frame.
  - c. Seismic Design Requirements: Per California Building Code.
  - d. Additional Framing: Provide miscellaneous steel framing not shown on drawings which is required to satisfy seismic criteria.
15. Flatwork Tolerances: Metals panels, fascias, sills and other sheet or plate fabricated items shall be flat and free of bow or "oil canning" or "read thru" of stiffeners, welds, etc. Exposed metal faces shall be of such flatness that the maximum uniform bow in 2 ft. (600mm) shall not exceed 1/32 in. (0.8mm) and the maximum overall variation in plane between high and low point within a panel shall not exceed 1/16 in. (1.5mm).
16. Unacceptable Conditions: Vibration harmonics, wind whistles, noise or other



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objectionable noises created by thermal movement, structural movement, or wind; thermal movement transferred to building structure; loosening, weakening or failure of fasteners, attachments or other components.

17. Design Modifications: Make design modifications of work shown only as may be necessary to meet performance requirements and coordinate the Work. Variations in details and materials which do not adversely affect appearance, durability or strength shall be submitted to the Architect for review. Maintain the general design concept without altering profiles and alignments shown.

### 1.4 SUBMITTALS

- A. Product Data: Submit, for Architect's action, material list with technical data documenting the location and primary function, quality, and performance of each material component or system to be used in the Work. Submit the following information from the manufacturer:
  1. Statement that each product to be furnished is recommended for the application shown.
  2. Manufacturer's specification and installation instructions for door units.
  3. Complete instructions for handling, storing, mixing, priming, installing, curing and protecting each glazing material.
- B. Shop Drawings: Submit shop drawings for Architect's action. Show on shop drawings typical and atypical details at large scale for conditions for every member, joint, anchorage, glazing system and interface with contiguous construction. Assemble shop drawings of the principal component parts which may be specified in other Sections into this submittal and prepare coordination details and erection diagrams. Prepare details at not less than 3 in. = 1 ft. (1:5) minimum scale. Show details of support system, method of attachment to building structure, anchorage details and interface with adjacent work. Show component locations and intersection details, method of isolating dissimilar materials, provisions for expansion and contraction, method of drainage of the system including gutters, weeps and flashings including method of drainage of condensation which might form external to the vapor barrier and reglazing sequence both in the factory and remedial for the field. Show reinforcement within framed swing doors and framed storefront systems required to comply with specified performance requirements and for support loads imposed by door weight, door operations and for door hardware. Shop drawings shall contain the seal of a licensed Structural or Civil Engineer registered in the state [in which the Project occurs]. Submit shop drawings as a minimum for the following:
  1. Swing door entrances both framed and unframed.
  2. Hardware Schedule: In conjunction with shop drawing submittal, submit complete hardware schedule organized into sets based on hardware specified. Coordinate hardware with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish. Include item name, name of the manufacturer and complete designations of every item required for each door opening.
  3. Glazing Schedule: In conjunction with shop drawing submittal, submit a glazing schedule utilizing the same designations shown on Drawings for glazed doors and openings listing glass types and thicknesses for each size opening and location.



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- C. Samples: Submit the following for Architect's action:
1. Color and Finish Samples: 3 sets of samples for each finish and color required. Submit sample finishes on aluminum having the specified alloy, temper, substrate preparation treatment and thickness of metal required for the Work. Provide 12 in. (300mm) lengths for extrusions and 12 in. (300mm) squares for sheet or plate; showing the maximum range or variation in color and shade.
- D. Calculations: Submit for Architect's information, the following calculations containing the seal of a licensed Structural or Civil Engineer registered in the State [where the project occurs]:
1. Engineering calculations to show that maximum deflections do not exceed specified performance requirements under full design loading.
  2. Structural calculations for frames, panels, connections and anchorage systems demonstrating that they will sustain imposed design loads.
  3. Calculations of expansion and contraction.
- E. Setting Drawings: Submit, for Architect's information, setting drawings and templates for the location of metal items for entrances and storefront work that are to be embedded in or anchored to concrete or masonry.
- F. Quality Control Submittals: Submit the following for Architect's information.
1. Test Reports
    - a. Copies of the following laboratory test reports:
      - 1) ASTM B137 - Anodic Coating Weight
      - 2) ASTM B244 - Anodic Coating Thickness
      - 3) ASTM B136 - Stain Test
  2. Certificates
    - a. Document Review: Before commencing work, submit a written statement signed by the Contractor and the Installer certifying that the Contract Documents, shop drawings and product data have been reviewed with material manufacturers' qualified technical representatives and that they agree the selected materials are proper, compatible with contiguous materials and adequate for the application shown.
    - b. Certification that the hardware supplied for operable doors are sufficient to carry weight of doors and imposed operational loads on doors.
    - c. Manufacturer's and fabricator's certification that the resinous coating complies with the Contract Documents and AAMA 2605.
    - d. Manufacturer's and fabricator's certification indicating that pigmented organic coating complies with the Contract Documents and AAMA 2603.



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- e. Manufacturer's and fabricator's certification that the anodic coating complies with the Contract Documents.
- 3. Installer's Qualifications: Evidence of successful completion of work of similar scope to that shown and specified for this Project.
- 4. Manufacturer's Qualifications: Evidence that the specified materials have been manufactured by the same source and successfully utilized for a minimum of 5 years on projects of a similar scope to that shown and specified for this Project.
- G. Closeout Submittals: Submit for Owner's documentation.
  - 1. Warranties: Special warranties as specified.
  - 2. Maintenance Manuals: Describing the materials, and procedures for cleaning and maintaining the entrances and storefront assemblies. Include manufacturer's data describing the materials and finishes used in the work.

### **1.5 QUALITY ASSURANCE**

- A. Qualified Installer: The entrance and storefront work shall be performed by an installer having 5 years experience in the installation of specified materials on comparable projects. The installer shall have the approval of the entrance and storefront materials manufacturer.
  - 1. Maintenance Proximity: The Installer shall maintain offices and repair or service facilities not more than 2 hours normal travel time from the Project site.
- B. Single-Source Responsibility: Obtain entrance and storefront Work from one source of a single manufacturer for each type of system. Obtain accessory products used in conjunction with the work from the entrance and storefront manufacturer or from sources acceptable to the entrance and storefront manufacturer.
- C. Single-Source Responsibility: Award the Work to a specialized firm, as part of the entire exterior wall system, to provide undivided responsibility for the complete exterior wall system; including the entrances and storefront Work specified herein.
  - 1. Comply with requirements of Section 08 03 50 "Exterior Wall, General".
- D. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from such authorities.
  - 1. Means of Egress Requirements: Comply with requirements of authorities having jurisdiction for revolving entrance doors serving as a component of a means of egress, including capability of collapsing into a book-fold position, minimum exit width, maximum turning speed, and maximum force required to collapse door wings.
- E. Basis of Design: When particular manufacturers' materials, products or processes are specified for an item of Work, any one thereof is acceptable for the Contractor to choose. An alternative material, product or process will be considered if the Contractor submits a written substitution request together with such information as may be necessary to assist





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the Architect in determining whether the proposed substitution is acceptable; the burden of proof rests solely upon the Contractor.

- F. Pre-Installation Meeting: Prior to the start of the Work, meet at the Project site to review material selections, methods and sequence of installation, special details and conditions, standard of workmanship, quality control requirements, job organization, coordination with other trades, and other pertinent topics related to the Work.

#### **1.6 DELIVERY, STORAGE AND HANDLING**

- A. Delivery of Fabricated Units: Deliver fabricated units and component parts to project site completely identified in accordance with erection diagrams. Store in accordance with manufacturer's instructions, above grade on dunnage, properly protected from the weather and construction activities.
- B. Protective Coatings or Coverings: Temporary coating and coverings may be furnished at manufacturer's or Contractor's option to protect the Work during shipment and construction. Such protection shall avoid development of non-uniformity in finishes, shall not impart a residue which would adversely affect the adhesion of sealants, nor cause other deleterious effects in the Work. Temporarily remove protection when requested by Architect for inspection of finishes, and completely remove protection when no longer required.
- C. Material Delivery: Deliver materials to Project site in manufacturers' unopened containers, fully identified with trade name, color, size, hardness, type, class, and grade. Store each item in accordance with manufacturer's instructions. Deliver, store and handle glass in accordance with manufacturer's recommendations; protected from weather, staining and damage. During storage and handling of glass provide cushions at edges to prevent impact damage. Protect glass from scratches and abrasion.

#### **1.7 PROJECT SITE CONDITIONS**

- A. Field Glazing: Do not perform glazing when temperature is below 40 deg. F. (4.5 deg. C.), unless the manufacturer of the glazing materials specifically recommends application of his materials at lower temperatures. If job progress or other conditions require glazing work when temperatures are below 40 deg. F. (4.5 deg. C.) (or below the minimum temperature recommended by the manufacturer), consult the manufacturer and establish the minimum provisions required to ensure satisfactory work. Record in writing to the manufacturer, with copy to the Architect, the conditions under which glazing work was performed and the provisions made to ensure satisfactory work.

#### **1.8 WARRANTIES**

- A. Warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and are in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.
- B. Special Warranty: Submit for Owner's documentation. Provide a written warranty, for five (5) year period, against defects in material or workmanship and leaks resulting from defects during the warranty period. Upon notification of defects, within the warranty period, make the necessary repairs at the convenience of the Owner. Warranty shall be signed by the Contractor and the firm awarded the work. Failures, include but are not limited to:





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1. Failure of the system to meet performance requirements including but not limited to excessive deflection, racking, warpage, excessive water leakage or air infiltration.
2. Failure of operational parts to function normally.
3. Deterioration, fading, excessive non-uniformity, pitting, cracking, peeling, crazing or discoloration of finishes and other materials beyond normal weathering.
4. Noise or vibration created by thermal and structural movement and wind.
5. Loosening or weakening of fasteners, attachments, and other components.
6. Sealant failure.

## PART 2 - PRODUCTS

### 2.1 METAL MATERIALS

- A. Aluminum Extrusions: Shapes as shown and as required to fulfill performance requirements, but not less than 1/8 in. (3mm) thick, unless otherwise shown. Suitable alloy and proper temper for extruding and fabricating with adequate structural characteristics, and suitable for finishing as specified.
- B. Aluminum Sheets and Plates: Sizes and minimum gauges as shown and as required to fulfill performance requirements. Suitable alloy and proper temper for forming and fabricate with adequate structural characteristics and suitable for finishing as specified.
- C. Stainless Steel: ASTM A240 (A240M); Provide the most suitable austenitic alloy, form and finish required to produce the Work. Provide Type 304 or Type 316 and low carbon Type 304L or 316L for components to be welded, unless otherwise noted.
  1. Plate And Sheet: ASTM A480 (A480M), Stretcher level sheets.
  2. Bar Stock and Shapes: ASTM A276.
  3. Round, Square and Rectangular Welded Tubing: ASTM A554, Grades MT 301, MT 302, or MT 304, as standard with manufacturer.
  4. Pipe: ASTM A312 (A312M), Grade TP 304.
  5. Castings: ASTM A743 (A743M), Grade CF8 or CF20.
- D. Bronze and Brass: Shapes as shown and as required to fulfill performance requirements. Standard commercial tempers and hardness and suitable for finishing as specified. Provide the following:
  1. Sheet, Plate, Bars, Rod and Wire: Muntz Metal, CDA Alloy 280; stretcher level sheets.
  2. Tube and Pipe: Red Brass, CDA Alloy 230.
  3. Extruded Shapes: CDA Alloy 385.



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4. Castings: ASTM B584, Alloy UNS No. C85700.
5. Forgings: ASTM B124 (B124M).

### 2.2 FASTENERS, ANCHORAGE AND REINFORCING

- A. Anchor Assemblies: 3-way adjustable anchors that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer/fabricator.
  1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A123 (A123M) or ASTM A153 (A153M) requirements. Provide bolts, washers and shims as required, hot dip galvanized, ASTM A153 (A153M), Class A.
  2. Steel Anchorage: Anchor assemblies secured to structural steel framing shall be fabricated in accordance with the criteria governing structural steel and where exposed, architecturally exposed structural steel.
- B. Fasteners: Stainless steel type 300 series, selected to prevent galvanic action with the components fastened. Where exposed in finished surfaces, use oval-head countersunk Phillips heads and color to match adjacent surfaces. Where fasteners screw-anchor into aluminum less than 1/8 in. (3mm) thick, reinforce the interior surface with aluminum or non-magnetic type stainless steel to receive screw thread threads or provide manufacturer's standard non-corrosive pressed-in splined grommet nuts. Screwed connections shall be drilled. Unless otherwise indicated, bolts and other fastening devices, including their accessory items (washers, nuts, etc.), shall incorporate self-locking devices and be torques tightened as required to achieve maximum torque tension relationship required by fasteners.
- C. Steel Angles, Plates, Bars, Rods and Other Steel Accessories Required to Join or Reinforce Assembly of Components: ASTM A36 (A36M) and ASTM A283 (A283M), galvanized or, if galvanized is not compatible with alloy of component parts, shop painted with primer specified herein after cutting to size. Galvanize items embedded or attached to concrete or masonry unless otherwise shown or specified.
- D. Aluminum Angles, Plates, Bars, and other Aluminum Members Required to Join or Reinforce Assembly of Aluminum Components: Alloys recommended by manufacturer or fabricator to develop required strength of assembly.

### 2.3 MISCELLANEOUS MATERIALS

- A. Glass and Glazing: As specified in Section 08 80 00 "Glazing".
- B. Hardware: As specified herein and in Section 08 70 00 "Hardware".
- C. Sealants: As specified in Section 07 92 00 "Joint Sealants".
- D. Stainless Steel Flashing: As specified in Section 07 62 00 "Sheet Metal Flashing and Trim".
- E. Stainless Steel Flashing: ASTM A666 (A666M), Type 304, dead soft fully annealed except where harder temper required for forming or performance; 0.015 in. (28 gage)

(0.4mm) thick unless otherwise shown, finish No. 2D. Provide 60 - 40 tin/lead solder, with acid-chloride type flux, except use rosin flux over tinned surfaces in accordance with ASTM B32.

**F. Weatherstripping**

1. Metal Framed Glass Swing Doors: Replaceable woven wool pile mortised into door stiles and head or jambs, head and sill of entrance frames, as shown.
2. Tempered Glass Swing Doors: Woven wool pile type, replaceable without removing tempered glass entrance doors from pivots.
3. Revolving Doors: Replaceable and adjustable rubber sweeps (without dismantling wings) with felt contact strips, mortised into edge of exterior stiles and head and sill rails of revolving door; woven wool pile mortised into edge of stiles at central shaft.

**G. Slip Gaskets (at bolted slip-joints in system: Non-metallic, low friction material (high impact polystyrene or nylatron) having the temperature resistance, moisture resistance and low abrasion properties as required to suit performance criteria. Provide "Eel-Slip Pads" (Scan-Pac), or approved equal.**

**H. Separator Gaskets (except at bolted slip-joints): Non-corrosive, non-toxic impregnated felt or butyl tape with pressure sensitive adhesive on one surface which is formulated for proper adhesion to metals specified, thickness and width as required. Gaskets shall contain temperature and moisture properties as required to suit specified performance criteria.**

**I. Thermal Separators: Polyvinylchloride, 50 Shore A durometer hardness +/- 5 or poured homogeneous structural polyurethane of a cross sectional profile, interlocking with aluminum extrusions (minimum 3/8 in. (9mm) separation) forming an integral structural unit.**

**J. Weep Baffles: PVC coated, reticulated, flexible open cell reticulated polyurethane foam; 30-40 pores per 1 in. (25mm) or as recommended by the fabricator. PVC coating shall have a bacteriostat additive added to the formulation. Provide PVC Coated SIF-G Industrial Foam (Foamex, Inc.) or approved equal.**

**K. Welding Electrodes: Type and alloy recommended by the producer of the metal to be welded and as required for color match, strength and compatibility in the fabricated items.**

**2.4 PAINTS AND COATING MATERIALS**

**A. Finish per requirements of 09 96 00 "High Performance Coatings"**

**B. Rust Inhibitive Primer for Ferrous Metals Not Galvanized: Compatible with finish coats of paint (if any) of the respective dry film mil thickness specified; One of the following:**

1. "Series V10" (Tnemec Co. Inc.); 2.0 - 3.5 mils (50 - 85 µm) d.f.t.
2. "Carbocoat 115 SG" (Carboline Co.); 2.0 mils (50µm) d.f.t.
3. "Amercoat 5105" (PPG Paints); 2.0 - 3.0 mils (50µm -75µm) d.f.t.

- C. Galvanizing Repair Paint: Zinc rich paint for repairing galvanized surfaces and field welds in compliance with ASTM A780.
- D. Dielectric Separator: Cold applied, asphalt emulsion type complying with ASTM D1187, non-sagging, resistant to severe corrosion conditions; applied in two coats for an overall minimum dry film thickness of 25 mils (635  $\mu$ m) or heavy coating of epoxy paint in minimum 2.0 mil (50  $\mu$ m) dry film thickness.
- E. Sound Damping Compound: Visco-elastic sound damping material in emulsion form, non-toxic, non-flammable; spray, brush or trowel applied; air-dried after application to form a non-tacky, non-marring film of medium hardness, with a flame spread rating of less than 25 and a smoke development rating of less than 50 when tested in accordance with ASTM E84. Provide one of the following:
  - 1. "Antivibe DL-10" (Blachford Ltd.; Distributed by AVNEC, Inc.).
  - 2. "GP-1, Damping Compound" (Sound Coat; Distributed by Controlled Acoustics Corp.)
  - 3. "Vibrasorb Damping Compound" (E.N. Murray Co., Inc.)

## **2.5 FABRICATION, GENERAL**

- A. General: Fabricate storefront and entrance components to meet performance and aesthetic criteria specified. Fabricate system at the manufacturer's shop to the fullest extent possible and before applying finishes. Fabricate system with materials proven compatible in testing specified.
- B. Field Measurements: Verify dimensions and conditions at the job site so that entrances and storefronts will accurately fit to adjacent work.
- C. Forming: Form work to true shapes, without distortion, with accurate surfaces and edges. Unless otherwise shown, form metal corners by bending to smallest radius possible without impairing the work. Machine cut or saw material for butt jointed or square corners.
- D. Assembly: Carefully fit and assemble work with continuity of line and design, using rigidly secured joints with hairline contact, unless otherwise shown. Form butt hairline joints with roll-over edge exposed. Grind off roll-over edge flush with and matching of adjacent metal. Fit and assemble work in the shop insofar as practicable. Disassemble units too large for shipment and provide alignment and splice plates for accurate field fit.
- E. Welding: Weld with electrodes and by methods recommended by the base metal manufacturer, and in accordance with applicable recommendations of the AWS, to avoid distortion or discoloration of exposed faces. Make welds continuous, unless otherwise shown. Grind exposed welds flush, to match adjacent metal. Bevel cut base metal before welding to maintain continuity of line at joints.
- F. Reinforcing: Reinforce members and joints with structural shapes and plates in concealed locations, as necessary for adequate strength, sag resistance and rigidity and to comply with performance criteria. Separate metal surfaces at moving joints with plastic inserts or other non-abrasive concealed inserts which will permanently prevent "freeze-up" of the joint. Fabrication of supporting steel elements shall be in accordance with AISC Manual of Standard Practice.



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- G. Fastenings: Provide concealed fastenings, unless otherwise shown. Locate necessary exposed fastenings, where permitted, in an orderly pattern, in accordance with reviewed shop drawings. Where fasteners screw-anchor into aluminum members less than 1/8 in. (3mm) thick, reinforce the interior with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard noncorrosive pressed-in splined grommet nuts.
- H. Framing Member Anchorages: Framing members attaching entrance and storefront components to building supports shall provide for 3-way adjustments to accommodate fabrication and construction tolerances and allow for thermal and building movements.
- I. Component Fabrication: Fabricate components to ensure that glazing is thermally and physically isolated from framing members. Fabricate components to allow for expansion and contraction, field adjustment, and minimum clearance and shimming at perimeter. Carefully fit and match work with continuity of line and design. Rigidly fit and secure corners and joints with screw and spline, internal reinforcement or welding. Make exposed framing and trim joints and connections flush, hairline and weatherproof.
- J. Frame Units: Factory assemble frame units according to shop drawings to greatest extent possible. Rigidly secure non-movement joints. Seal joints watertight, unless otherwise indicated. Assemble components to drain water passing joints, condensation occurring in glazing channels, condensation occurring within framing members, and moisture migrating within the system to the exterior.
- K. Factory-Glazed Structural Silicone Glazing Work: Clean frames and glass surfaces with an approved solvent. Prime surfaces and apply structural sealant ASTM C1401 "Standard Guide for Structural Sealant Glazing". Clean excess structural sealant before curing. Do not transport units until silicone has cured.
  - 1. Aluminum Finish at Structural Silicone Installations: Provide one of the following finishes
    - a. Mill finish is not acceptable at structural silicone bonding surfaces, nor for any aluminum.
    - b. Aluminum surface to which structural silicone will be adhered shall have a finish which demonstrates by test the ability to satisfy specified requirements. Subject to demonstrated effectiveness by satisfactory testing, acceptable finishes are as follows.
    - c. A paint conforming to AAMA 2605.
    - d. Alodine conversion coating. The product used to form the alodine chemical conversion coating on aluminum extrusions or paneling shall conform with ASTM D1730, Type B, method 5 (amorphous chromium phosphate treatment) or method 7 (amorphous chromate treatment). Coating weight of chemical conversion coating shall conform with that specified in ASTM B449, section 6, class 1. Processing shall conform with that specified in ASTM B449, section 5.
    - e. Architectural Class I anodizing conforming to AAMA 611.
- L. Glazing Pockets: Provide minimum clearances for thickness and type of glass indicated according to GANA's "Sealant Manual" and "Glazing Manual".

- M. Dissimilar Metals: Separate dissimilar metals with dielectric separator to prevent galvanic action. Do not extend coatings onto exposed surfaces.
- N. Weepholes: Provide weepholes and internal water passages in the glazing recess as recommended by the glass manufacturer to conduct infiltrating water to the exterior. Provide weep baffles secured to inside of frame behind weepholes to prevent water migration.
- O. Sound Damping: Apply sound damping compound on inside of stiles and rails and elsewhere where shown.

## **2.6 FINISHES**

- A. Aluminum Finishes: Remove die markings prior to finishing operations. Where necessary to remove die markings from any part of the work, members must be finished by the same process, whether or not die markings exist. Perform this work in addition to the finish specified. Scratches, abrasions, dents and similar defects are unacceptable.
  - 1. 3 Coat Fluoropolymer Coating System Per 09 96 00 "High Performance Coatings"
- B. Stainless Steel Finishes
  - 1. Per 05 70 00
- C. Brass and Bronze Finishes
  - 1. Per 05 70 00
  - 2. Clear Organic Coating: Clear air-drying acrylic lacquer specially developed for coating copper alloy products, applied by air-spray in 2 coats per manufacturer's directions, with interim drying, to a total thickness of 1.0 mil (0.025mm). Provide "Incralac" (as developed by International Copper Research Corporation).

## **2.7 SHOP PAINTING FOR FERROUS METAL**

- A. General: Shop paint ferrous metal work, except members or portions of members to be embedded in concrete or masonry, surfaces and edges to be field welded, unless otherwise specified.
- B. Cleaning
  - 1. Remove oil, grease and similar contaminants in accordance with SSPC SP-1 "Solvent Cleaning", prior to any additional surface preparation specified.
  - 2. Clean and prepare metal surfaces before applying shop coat. Remove rust and mill scale in accordance with SSPC SP-3 "Power Tool Cleaning".
- C. Priming
  - 1. Immediately after surface preparation, apply primer using painting methods which will result in full coverage and dry film thickness specified.
  - 2. Apply one shop coat of primer to fabricated metal items, except apply 2 coats of



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primer to surfaces inaccessible after assembly or erection. Change color of second or finish coat to distinguish it from the first coat.

#### 2.8 METAL FRAMED SWING DOORS

- A. Type: Provide [aluminum] [stainless steel] [bronze] framed glass doors with matching fittings and hardware of sizes, shapes and profiles shown.
- B. Integrated Door Assemblies: Provide complete integrated door assemblies with tubular framework, designed and fabricated with mechanical joints utilizing heavy concealed reinforcing plates and other items necessary for proper installation and operation. Units shall be capable of supporting weight of units withstanding imposed operational loads as well as complying with specified performance criteria.
- C. Fabrication: Fabricate doors to facilitate replacement of glass or panels without disassembly of stiles and rails. Provide continuous channel frame welded into door body. Stile and rail doors shall be blanked out from one sheet of metal. No face welded shall be permitted. Prepare doors for glazing and weatherstripping as shown. Provide manufacturer's standard replaceable type weatherstripping complying with AAMA 701.1.
- D. Reinforcement: Reinforce doors and frames for finish hardware in accordance with manufacturer's templates. Provide the complete hardware package for each swing door in accordance with specification Section 08 70 00 "Finish Hardware".
- E. Glass for Metal Framed Swing Doors: Provide glass and glazing as specified in Section 08 80 00 "Glazing". Cut and prefit glass at the factory and install under the swing door manufacturer's supervision.

#### 2.9 TEMPERED GLASS SWING DOORS

- A. General: Provide where shown, 1/2 in. (12mm thick fully tempered glass doors with aluminum with finish with 3-3/8 in. (84mm) square rails and/or patch fittings with welded corner construction and solid ends unless otherwise shown or specified. Prepare doors to receive hardware as specified in Section 08 70 00 "Hardware". Machine grind and polish exposed edges of glass. Before tempering glass, provide holes and cutouts to receive hardware. Cutting, drilling or other alterations to the glass after tempering is not permitted. Maintain accurate relation of planes and angles with hairline fit of contacting members. In areas where sidelights or other fixed panels are shown, provide matching rails as specified for doors.
- B. Manufacturer: Subject to compliance with requirements, provide tempered glass swing doors with full top and bottom metal rails, provide one of the following:
  - 1. "Series 640C" (Blumcraft of Pittsburgh).
  - 2. "1600 Series" (Kawneer)
  - 3. "Type P" (Oldcastle Glass).

#### 2.10 GLAZED FRAMES FOR STOREFRONT AND TRANSOMS

- A. Type: Provide with MTL-01 FIN-01, flush glazed jambs, sills and mullion members for glazing as shown. Provide concealed structural framing as required to comply with



specified performance requirements.

- B. Fabrication: Fabricate framing in profiles indicated for flush glazing (without projecting stops). Provide subframes and reinforcing of types indicated or, if not indicated, as required for a complete system. Factory assemble components to greatest extent possible. Disassemble components only as necessary for shipment and installation. Provide glazing rebates as required by the GANA, with weepholes for drainage, and removable interior glazing beads. Fabricate glazed frames for storefront and transoms with an integrally concealed low conductance thermal separator to eliminate direct metal to metal contact between exterior metal and metal exposed on the interior. Coordinate the detailing of the glazed frames with adjacent entrances and the work of other trades.
- C. Snap-On Covers: Where snap-on covers are used, provide a minimum of two (2) concealed fasteners per 5 ft. (1.5m) length to prevent displacement or accidental removal of trim.

### **PART 3 - EXECUTION**

#### **3.1 GENERAL**

- A. Manufacturer's Instructions: Prepare substrates and install the work of this Section, including components, and accessories in accordance with the manufacturer's instructions, except where more stringent requirements are shown or specified, and where project conditions require extra precautions or provisions to ensure satisfactory performance of the Work.

#### **3.2 EXAMINATION**

- A. Verification of Conditions: Examine the areas to receive the Work and the conditions under which the Work would be performed. Contractor shall remedy conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.
- B. Verify dimensions of supporting structure by field measurements so that work will be accurately designed, fabricated and fitted to the structure. Tolerances for supporting structure are specified in other Sections.

#### **3.3 PREPARATION**

- A. Substrate Acceptability: Commencement of installation shall constitute acceptance of substrate conditions by the Installer.
- B. Coordination
  - 1. Templates: Obtain and distribute, to parties involved, templates for doors, frames, and other work specified to be factory prepared for installing entrance doors.
  - 2. Coordinate size and location of scheduled recesses hardware and equipment in floor construction, including anchorages for frames and supports. Furnish setting drawings, templates, and directions for installing hardware, equipment and anchorages that are to be embedded into concrete. Deliver items to Project site in time for installation.



3. Electrical System Roughing-in: Coordinate layout and installation of entrance door assemblies requiring connections to power supplies and/or security-access-control system.

### **3.4 INSTALLATION**

- A. General: Coordinate installation with the Work of other trades. Provide inserts and other anchorage devices at the proper time so as to avoid delays. Install the Work level, plumb, and true to line, with uniform joints. Support on shims and secure in place by bolting to clip angles and similar supports anchored to supporting structure. Use only the types of equipment, wedges, spacers, shims and other items during installation which will not corrode nor stain or mar the finish surfaces.
- B. Assumed Design Temperature: Dimensions shown on Drawings are based on an assumed design temperature of 70 deg. F. (21 deg. C.). Fabrication and erection procedures shall take into account the ambient temperature range at the time of the respective operations.
- C. Erection: Install entrances and storefronts plumb and true in alignment with established lines and grades without warp or rack of framing members and doors. Anchor securely in place. Install components to drain water passing joints and condensation and moisture occurring or migrating within the assembly to the exterior. Lubricate operating hardware and other moving parts. Do not erect members which are warped, bowed, deformed or otherwise damaged to such extent as to impair strength or appearance. Remove and replace members damaged in the process of erection. Paint concealed contact surfaces of dissimilar materials with dielectric separator or provide other type approved separation. Prime paint concealed ferrous metal with specified metal primer. Finish paint exposed primed ferrous metal using finish paint system in accordance with Section 09 91 00 "Painting". Seal joints in a concealed manner, unless exposed sealant is shown. Comply with requirements of Section 07 92 00 "Joint Sealants". Install Work of this Section and demonstrate that the completed operable units are installed in a condition acceptable to the Owner and Architect.
- D. Cutting and Trimming: Cut and trim components only with the approval of the manufacturer or fabricator and in accordance with his recommendations. Do not cut reinforcing. Restore finish completely. Remove evidence of cutting and trimming.
- E. Revolving Door Installation: Coordinate installation of revolving entrance door assemblies with adjacent entrance and storefront systems to ensure that wall assemblies, including flashing, trim, and joint sealants, are protected against damage from the effects of weather, age, corrosion, and other causes. Coordinate size and location of recesses in floor construction for recessed, floor-mounted speed controllers including anchorages for frames and supports. Furnish Setting Drawings, templates, and directions for installing anchorages that are to be embedded into concrete. Deliver items to Project site in time for installation. Insert pivot bearing in rough-in floor opening set on level bed of nonshrink, nonmetallic grout. Fill annular space between pivot bearing and sides of recess with nonshrink, nonmetallic grout.
- F. Electrical Wiring and Connections: For entrances requiring electrical wiring, provide complete installation of wiring (both power and lo voltage) to connect parts of the equipment. Install wiring using the materials and installation procedures for motors and controls as specified in Division 26. Interconnect electrical components as required for proper operation. Test the entire wiring system for insulation to ground.

- G. Frame Units: Factory assemble frame units according to Shop Drawings to greatest extent possible. Rigidly secure nonmovement joints. Seal joints watertight, unless otherwise indicated. Assemble components to drain water passing joints, condensation occurring in glazing channels, condensation occurring within framing members, and moisture migrating within the system to the exterior.
- H. Erection Tolerances: Erect components within the following tolerances:
  - 1. Variation From Plumb: 1/8 in. (3mm) maximum.
  - 2. Variations From Level: 1/8 in. (3mm) maximum.
  - 3. Variation From Theoretical Position: 1/4 in. (6mm) maximum.
  - 4. Offset In Alignment Of Consecutive Members: 1/16 in. (1.5mm) maximum.
  - 5. Diagonal Measurements: The maximum difference in diagonal measurements shall not exceed 1/8 in. (3mm).
  - 6. Offset at Corners: The maximum out-of-plane offset of framing at corners shall not exceed 1/32 in. (0.8mm).

### **3.5 FIELD QUALITY CONTROL**

- A. Contractor's Quality Control Responsibilities: Contractor is solely responsible for quality control of the Work.
- B. After completion of the installation and nominal curing of sealants and glazing compounds, test 100% of glazed frames for storefronts and transoms for water leaks. Conduct tests in accordance with AAMA Standard 501.2, "Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Wall and Sloped Glazing Systems", except perform tests on 100% of glazed frames for storefronts and transoms. Provide powered scaffold, hose, radios, water supply and manpower to perform scheduled tests. Correct deficiencies observed as a result of test.

### **3.6 ADJUSTING**

- A. Adjustment: Adjust doors to provide an even, tight fit at contact points and weather stripping for smooth operation and weather tight closure. Adjust doors to operate smoothly with hardware and operators functioning properly. Lubricate hardware and other moving parts. Readjust doors after repeated operation of completed installation equivalent to three days' use by normal traffic (100 to 300 cycles).

### **3.7 TOUCH-UP**

- A. Touch-Up Painting: Field paint marred or abraded shop paint and welds after cleaning these areas.
- B. Touch-Up to Fluoropolymer Resinous Coated Paint System: Touch up damaged, scratched, marred or abraded exposed fluoropolymer resinous coated paint utilizing manufacturer/fabricator approved air dried fluoropolymer resinous paint system in matching colors and sheen. Obtain Architect's approval of finished touch-up.



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- C. Touch-Up to Baked Organic Coated Paint System: Touch up damaged, scratched, marred or abraded exposed baked organic coatings utilizing manufacturer/fabricator approved paint system in matching colors and sheen. Obtain Architect's approval of finished touch-up.

**3.8 CLEANING**

- A. Cleaning: Upon completion of installation, wash exposed surfaces using methods as recommended by manufacturer to leave clean and free from blemishes.
- B. Maintenance of Installation: Maintain the entrances and storefronts throughout the construction period in a clean and properly protected condition so that it will not be damaged at the time of acceptance by the Owner. Cleaning and protective methods shall be carefully selected, applied and maintained so that finishes will not become uneven or otherwise impaired as a result of unequal exposure to light and weathering. Immediately remove deleterious material from finished surfaces.

**3.9 PROTECTION**

- A. Protection: Protect the Work during construction period so that it will be without indication of deterioration, use or damage at time of acceptance. When requested for inspection of finishes, remove and replace temporary protection. Remove protection when no longer required.

**END OF SECTION**

**SECTION 08 42 29  
SLIDING DOOR ENTRANCES**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. General: Provide furniture in accordance with requirements of the Contract Documents.
  - 1. This section includes the following types of automatic entrances:
    - a. Exterior bi-parting sliding automatic entrances.
- B. Related Sections:
  - 1. Division 7 Sections for caulking to the extent not specified in this section.
  - 2. Division 08 Sections for "Aluminum-Framed Entrances and Storefronts" for entrances furnished and installed separately in Division 8 Section.
  - 3. Division 8 Section "Door Hardware" for hardware to the extent not specified in this section.
  - 4. Division 08 Section "Glazing" for materials and installation requirements of glazing for automatic entrances.
  - 5. Division 26 and 28 Sections for electrical connections including conduit and wiring for automatic entrance operators and access-control devices.

**1.2 REFERENCES**

- A. References: Refer to the version year adopted by the Authority Having Jurisdiction.
  - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
  - 2. ICC/IBC - International Building Code.
  - 3. CUL – Approved for use in Canada.
  - 4. NFPA 70 - National Electrical Code.
  - 5. NFPA 101 - Life Safety Code.
- B. American National Standards Institute (ANSI) / Builders Hardware Manufacturers Association (BHMA).
  - 1. ANSI/BHMA A156.10 American National Standard for Power Operated Pedestrian Doors.
  - 2. ANSI Z97.1 Standards for Safety Glazing Material Used in Buildings.
  - 3. Underwriters Laboratories (UL).
  - 4. UL 325 Standard for Safety for Door, Drapery, Gate, Louver and window Operators and Systems.
  - 5. American Association of Automatic Door Manufacturers (AAADM).
- C. American Society for Testing and Materials (ASTM).
  - 1. ASTM B221 Standard Specification for Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Profiles and Tubes.
  - 2. ASTM B209 Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate.



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- D. American Architectural Manufacturers Association (AAMA).
  - 1. AAMA 611 Voluntary Specification for Anodized Architectural Aluminum.
- E. National Association of Architectural Metal Manufacturers (NAAMM).
  - 1. Metal Finishes Manual for Architectural Metal Products.
- F. International Code Council (ICC).
  - 1. CBC: California Building Code Building Code.

### 1.3 DEFINITIONS

- A. Activation device: Device that, when actuated, sends an electrical signal to the door operator to initiate the door operation.
- B. Monitored Safety Devices: A tested system that works in conjunction with the automatic door control that detects the presence of a person or an object within a zone where contact could occur and provides a signal to stop the movement of the door.
- C. AAADM: American Association of Automatic Door Manufacturers.
- D. For automatic door terminology, refer to ANSI/BHMA A156.10 for definitions of terms.

### 1.4 PERFORMANCE REQUIREMENTS

- A. General: Provide automatic doors that have been designed and fabricated to comply with specified performance requirements, as demonstrated by testing manufacturers corresponding systems.
- B. Compliance:
  - 1. ICC/IBC International Building Code
  - 2. ANSI/BHMA A 156.10 American National Standard for Power Operated Doors Pedestrian Doors.
  - 3. UL 325 Compliant
  - 4. NFPA 70 National Electrical Code.
  - 5. NFPA 101 Life Safety Code
  - 6. CUL Approved for use in Canada
- C. Automatic Door equipment accommodates medium to heavy pedestrian traffic.
- D. Automatic Door equipment accommodates up to the following weights for active leaf door:
  - 1. Bi-Parting Doors: 190 lb. (87 kg) per active breakout leaf.
  - 2. Single Slide Doors 220 lb. (100 kg) per active breakout leaf.
- E. Operating Temperature Range: Capable of - Minus 35 Degrees F to plus 130 degrees F (minus 37 C to plus 55 degrees C) ambient.
- F. Entrapment Force Requirements:
  - 1. Power-Operated Sliding Doors: Not more than 30 lbf (133 N) required to prevent stopped door from closing.



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2. Sliding doors provided with a breakaway device shall require no more than 50 lbf (222 N) applied 1 inch (25 mm) from the leading edge of the lock stile for the breakout panel to open.

### 1.5 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles fabrication, operational descriptions and finishes.
- B. Shop Drawings: Submit for Architect's action. Include plans, sections and elevations at no less than 1/2" = 1' and details at 3" = 1'. Field verify rough opening at entrances prior to submitting shop drawings. Include hardware mounting heights, and additional accessories or other attached contiguous work.
- C. Wiring Diagrams: Provide wiring diagrams showing connection to power supply, actuators and other connected components.
- D. Samples: Submit samples for Architect's action of all exposed components no less than 6x6"
- E. Manufacturer's Field Report: Submit manufacturer's field reports from AAADM certified technician of inspection and approval of doors for compliance with ANSI/BHMA A 156.10 after completion of installation.
- F. Quality Control Submittals: Submit for Architect's information.
  1. Certificates
    - a. Document Review: Before commencing work, submit a written statement signed by the Contractor and the Applicator certifying that the Contract Documents, shop drawings and product data have been reviewed with furniture manufacturers' qualified technical representatives and that they agree the selected materials are proper and adequate for the application shown
- G. Closeout Submittals: Submit for Owner's documentation.
  1. Operating and Maintenance Manuals: Submit for Architect's information and per Owner direction under

### 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Installers, trained by the primary product manufacturers, with a minimum 5 years documented experience installing and maintenance of units similar in material, design, and extent to that indicated in this specification and whose work has resulted in construction with a record of successful in-service performance. Manufacturer's authorized representative who is trained and approved for installation and maintenance of units by AAADM required for this Project.
- B. Manufacturer's Qualifications: 10 years minimum of documented experience in manufacturing door equipment similar to that indicated within this specification with a proven record of successful service performance. A manufacturer with company certificate issued by AAADM.



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- C. Source Limitations for Automatic Entrances: Obtain automatic entrances from single source from single manufacturer.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- E. Power-Operated Door Standard: ANSI/BHMA A156.10 Current year.
- F. Emergency-Exit Door Requirements: Comply with requirements of authorities having jurisdiction for automatic entrances serving as a required means of egress.
- G. Pre-Installation Conference: Conduct conference at site or a mutually agreed site if required.

### **1.7 PROJECT/SITE CONDITIONS**

- A. Site Conditions: Field Measurements: Verify actual dimensions of openings to receive automatic entrances by field measurements before fabrication.

### **1.8 COORDINATION**

- A. Coordinate sizes and locations of recesses in concrete floors for recessed sliding tracks that control automatic entrances. Concrete, reinforcement, and formwork requirements are specified in Division 03.
- B. Coordinate hardware with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish. Coordinate hardware for automatic entrances with hardware required for rest of project.
- C. Electrical System Roughing-in: Coordinate layout and installation of automatic entrances with connections to power supplies and access-control system.

### **1.9 WARRANTY**

- A. Automatic Entrance Doors shall be free of defects in material and workmanship for a period of One (1) year from the date of substantial completion.
- B. During the warranty period a factory trained technician shall preform service and affect repairs. A safety inspection shall be performed after each adjustment or repair and a completed inspection form submitted to the owner.
- C. During the warranty period all warranty work shall be performed during normal working hours.

## **PART 2 - PRODUCTS**

### **2.1 ACCEPTABLE MANUFACTURERS**

- A. Dormakaba • Reamstown, PA • 1-844-SPEC-NOW (1-844-773-2669) • Website: [www.dormakaba.us](http://www.dormakaba.us) or approved equal.



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**2.2 SLIDING AUTOMATIC ENTRANCES**

A. Model: dormakaba ESA Series

**1. ESA 400 Fine Frame Bi Parting full breakout with two operable sidelites  
Automatic Door (Basis of Design)**

a. Sliding Automatic Door Configuration:

- 1) Bi-Parting, full breakout door system.  
Configuration: Bi-parting, four equal panels two sliding panels and two breakaway sidelites.  
Traffic Pattern: Two –Way  
Emergency Breakaway Capability: Interior sliding leaves and sidelites.  
Mounting: Between jambs

**2.3 ALUMINUM DOORS AND FRAMES**

A. Doors and Frames: Extruded Aluminum, Alloy 6063-T5

1. Door panels shall have a minimum .125 inch (3.2 mm) structural wall thickness throughout entire extrusion length.
2. Header made from extruded aluminum and extending the full width of the automatic door. (4 ½" wide by 7 1/2" depth) Header shall conceal all operable parts, carrier assemblies and roller tracks. Unit is to have removable access panels for adjustment and service of operator and controls.
3. The sliding door system shall include a full length interlocks securing the leading stile of the sidelite and the butt stile of the sliding door together.
4. Panel Dimensions: All visible aluminum door micro stiles shall have a face dimension of: pivot stiles 1-5/16 inch (33 mm), interlock stiles 1-3/16 inch (30 mm), and lock stiles 31/32 inch (24.6 mm) plus an 11/32 inch (8.7 mm) neoprene nosing for weather sealing. All visible door rails shall have a face dimension: bottom rails 3 7/16" inches (87mm) and tapered top rails of 6 3/8" (162mm) including the breakout assembly and must be full height of door.
5. Weather stripping shall meet AAMA 701-11 Class A, slide in type, replaceable nylon retained by the aluminum extrusions to reduce energy loss. The following types of weather-stripping are required: nylon pile weather stripping on the door bottoms; dual pile weather-stripping at sliding door lead edges; weather-stripping between the carrier and header on the sliding doors; dual pile weather-stripping at the interlock rails between the sliding door and sidelites; dual pile weather-stripping between the sidelites doors and the door jambs.

B. Glass: Glazing shall comply with ANSI Z97.1.

1. All glazing shall match GL-2A, refer to 08 80 00 "Glazing" for additional information.
2. Glazing Active Door Panels 3/8" tempered, factory glazed.



3. Glazing Sidelite Door Panels 3/8" tempered factory glazed.
4. Glazing Transom Panel 1/2" **GL-02** tempered, unless otherwise specified

## 2.4 DOOR OPERATORS

- A. Sliding Door Carrier Assemblies and Overhead Roller Tracks: Manufacturer's standard carrier assembly that allows vertical adjustment; consisting of delrin-covered, ball-bearing-center wheels operating on a continuous roller track. Support doors from carrier assembly by adjustable cantilever and pivot assembly.
  1. Rollers: Minimum of two ball-bearing roller wheels and two antirise rollers for each active leaf.
- B Operator and Controller: a system with an electro-mechanical operator and microprocessor controller. Components consist of a DC permanent magnet motor, self-lubricating drive system and a wear-free digital rotary encoder all linked to a fully integrated digital microprocessor controller
  1. Features:
    - a. Power opening and closing.
    - b. Drive System: belt
    - c. Adjustable opening and closing speeds.
    - d. Adjustable hold-open time between 0 and 30 seconds.
    - e. Obstruction recycle.
    - f. Intergraded access control capabilities.
  2. Door Switches: Interior side mounted program switches consisting of:
    - a. Main Switch-Auto-Close-Open, operates door in fully automatic mode, turns door off, or keeps it fully open.
    - b. Exit Only Switch: on/off, only exit side activation device will initiate door opening.
    - c. Partial Opening Switch: on/off Energy saving opening mode limits the width opening.
    - d. Switch: Keyed
  3. Controller shall provide a means to verify presence sensor functionality and the connection between the controller and sensor(s) as required by the ANSI 156.10 standard. This closed loop monitoring system, upon detection of fault in the sensor or wiring shall cause automatic operation to cease.

## 2.5 ACTIVATION AND SAFETY

- A. Provide controls in accordance with ANSI/BHMA standard for condition of exposure and for long-term, maintenance-free operation under normal traffic load. Only safety systems (sensors) that have been tested and approved should be used in conjunction with manufacturer systems and products.
- B. Combination Motion/Presence Sensors: Self-contained units; consisting of both motion and presence sensors in a single housing; adjustable to provide detection field sizes and functions required by ANSI/BHMA A156.10.

Motion Sensor: K-band-frequency, doppler effect radar.

Provide capability for switching between bidirectional and unidirectional detection.

For one-way-traffic entrances, sensor on egress side shall not be active when doors are fully closed.

Presence Sensor(s): Active infrared sensor shall provide two over lapping zones that provide presence detection in the threshold while the door is in the open position

Activation Device:

**Push Plate: Hard wired 6 inch round silicone bronze push plate to match MTL-4 engraved with "Push to Open" with a blue handicap logo.**

*The California Building Code requires two push-plate actuators at each actuator location—one mounted between 178 and 203 mm (7 and 8 in.) from the floor to the centerline, and the other mounted between 762 and 1118 mm (44 in.) above the floor. Vertical actuation bars may be used in lieu of two separate actuators, with the bottom of the bar at 127 mm (5 in.) maximum above the floor and the top at 889 mm (35 in.) minimum above the floor.*

## 2.6 ELECTRICAL

A. Electrical 120 VAC, 60 Hz, 5 Amp service.

Battery Back-up: Concealed in the door header case and capable of full operation including sensor capabilities for 200 cycles.

## 2.7 HARDWARE

A. General: Provide manufacturers standard hardware as required for proper door operation. Break away hardware are integral parts of the door design and are supplied by the manufacturer to comply with applicable codes.

- 1) Locking Hardware:
  - a) Each sliding door panel shall have a single-point lock on the bottom rail. Door is provided with a continuous interlock rail that latches the sliding panel(s) to the sidelite panel(s) when the door system is in the fully closed position.
  - b) Each active sliding door provided with a maximum single-point floor lock, with provisions for a key cylinder on the exterior and a thumb turn on the interior in accordance with NFPA
- 2) Automatic Locking for Sliding Door: Electrically controlled device mounted in header that automatically locks door against sliding when in closed position. Use battery back up to insure enhanced level of security.
- 3) Exit Device: dormakaba GP1000, top locking bolt with interchangeable core cylinders or cylinder and thumb turn. UL-listed and BHMA-certified (ANSI/BHMA Grade 1, Type 2).
  - a) Finishes: satin brass w/o lacquer
- 4) Threshold:
  - a) Sliding Door Threshold: ESA 400 Manufacturer's standard threshold members and bottom-guide track system, with a 3/8" diameter pin in a polyethylene covered slot.



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- (1) Configuration: No threshold across door opening and recessed guide track system at sidelites.

### 2.8 ALUMINUM FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Painted Finish:
  1. Kynar paint finish, 3 coat fluoropolymer coating. Refer to 09 96 00 "HIGH PERFORMANCE COATINGS" for additional information.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine doors and frames with Installer present, for compliance with requirements for installation tolerances, wall and floor construction and other conditions affecting performance of automatic entrances.
- B. Examine roughing in for electrical source power to verify actual locations of wiring connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. General: Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure non-movement joints.
- 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.
- C. Install surface-mounted hardware using concealed fasteners to greatest extent possible.
- D. Set headers, carrier assemblies, tracks, operating brackets, and guides level and true to location with anchorage for permanent support.
- E. Door Operators: Connect door operators to electrical power distribution system as specified in Division 26 Sections.
- F. Glazing: Install glazing as specified in Division 08 Section Glazing according to automatic door manufactures instructions.
- G. Sealants: Comply with requirements specified in Division 07 Section "Joint Sealants" to provide weathertight installation.
- H. Signage: Apply signage on both sides of each door and each sidelight as required by ANSI/BHMA A 156.10



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AUTOMATIC SLIDING DOORS**

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**3.3 FIELD QUALITY CONTROL**

- A. Manufacturer's representative shall provide technical assistance and guidance for installation of automatic doors.
  - 1. Factory trained and AADM certified representative shall test and inspect each automatic door to determine compliance of the installed system to ANSI/BHMA A 156.10

**3.4 ADJUSTING**

- A. Adjust door operators, controls, and hardware for smooth and safe operation and for weathertight closure; comply with requirements in ANSI/BHMA A156.10.

**3.5 CLEANING AND PROTECTION**

- A. Clean glass and metal surfaces promptly after installation. Remove excess glazing and sealant compounds, dirt, and other substances. Repair damaged finish to match original finish.
  - 3.5.1.1.A.1 Comply with requirements in Division 08 Section "Glazing" for cleaning and maintaining glass.

**3.6 DEMONSTRATION**

- A. Engage a factory authorized representative to train Owner's maintenance personnel to adjust, operate, and maintain safe operation of automatic entrances.

**END OF SECTION**

**SECTION 08 70 00  
HARDWARE**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. General: Provide hardware in accordance with requirements of the Contract Documents.
- B. Related Work Specified Elsewhere
  - 1. Section 01 81 13 "Sustainable Design Requirements" for additional references, definitions, documentation requirements, action plans, meetings, and performance requirements of products and systems.
  - 2. Cabinet hardware is specified in Section 06 40 00 "Architectural Woodwork".
  - 3. Steel doors and frames are specified under Section 08 11 13 "Hollow Metal Doors and Frames".
  - 4. Wood doors are specified under Section 08 14 00 "Wood Doors".
  - 5. Except for master keyed cylinders, hardware for exterior entrance doors is specified Section 08 41 00 "Entrances and Storefronts".
  - 6. Smoke detectors, fire control systems, wiring for electromechanical locks, electromagnetic holders, card access, door control, annunciation systems and like systems is specified in various Division 26 specification sections.

**1.2 REFERENCES**

- A. General: Comply with the applicable provisions of the referenced standards except as modified by governing codes and the Contract Documents. Where a recommendation or suggestion occurs in the referenced standards, such recommendation or suggestion shall be considered mandatory. In the event of conflict between referenced standards, this specification or within themselves, the more stringent standard or requirement shall govern.
- B. American National Standards Institute (ANSI): "Builders Hardware and Specialties" - ANSI/BHMA A156 (Complete Series).
- C. Door and Hardware Institute (DHI)
  - 1. "Sequence and Format for the Hardware Schedule".
  - 2. "Recommended Locations for Arch. Hardware for Standard Steel Doors and Frames".
  - 3. "Recommended Locations for Arch. Hardware for Flush Wood Doors".
  - 4. "Keying Procedures, Systems and Nomenclature".
- D. National Fire Protection Association (NFPA)

1. "Life Safety Code" - NFPA 101.
2. "Fire Doors and Windows" - NFPA 80.
- E. Underwriter's Laboratories (U.L.)
  1. Safety - "UL Accident Equipment List".
  2. Fire Rating - "Building Materials Directory".
- F. U.S. Architectural & Transportation Barriers Compliance Board's "ADA-ABA Accessibility Guidelines" and ICC/ANSI A117.1.

### **1.3 SYSTEM DESCRIPTION**

- A. Design Criteria
  1. Accessibility Requirements: For hardware on doors in an accessible route, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "ADA-ABA Accessibility Guidelines" and ICC/ANSI A117.1.
    - a. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf (22.2 N).
    - b. Comply with the following maximum opening force requirements:
      - 1) Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
      - 2) Sliding or Folding Doors: 5 lbf (22.2 N) applied parallel to door at latch.
      - 3) Exterior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
      - 4) Exterior, Fire-Rated Hinged Doors: 15 lbf (66.7 N) applied perpendicular to door.
    - c. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than [1/2 inch (13 mm) high] [and] [3/4 inch (19 mm) high for exterior sliding doors].
    - d. Adjust door closer sweep periods so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches (75 mm) from the latch, measured to the leading edge of the door.

### **1.4 DEFINITIONS**

- A. Hardware Definitions and Identification: Each item of hardware is specified utilizing a hardware definition, a manufacturer's name and catalog number in "PART 2 - PRODUCTS", and the hardware for doors is listed by Sets in Section 08 70 10 "Hardware Set Schedule".

B. Abbreviations: The following abbreviations are used in the text:

H.O.	Hold open	N.H.O.	Non Hold Open
S.H.O.	Selective Hold Open	A.H.O.	Automatic Hold Open
DA	Delayed Action	HC	Handicapped Accessible
FS	Fail Safe	FSE	Fail Secure
EM	Electrified Mortise	ER	Electrified Rim
EL	Electric Latch Retraction	RQE	Request to Exit
RX	Request to Exit	ALR	Alarm/Remote Monitoring
SS	Signal Switch		

## 1.5 SUBMITTALS

- A. Product Data/Catalog Cuts: Submit for Architect's action. Prior to preparation of hardware schedule, submit manufacturer's catalog cuts, technical literature, specifications and installation instructions describing the general properties of each hardware item, material and accessory to be used in the Work. Identify each item, and include the Architect's hardware set number.
- B. Samples: Submit for Architect's action. Submit samples of each item of exposed hardware used, labeled and identified by the Architect's hardware set. Samples will be reviewed for color and appearance only. Furnish sufficient samples to establish the full range of colors and textures for materials exposed in the finished work. Acceptable undamaged samples will be delivered to the project site for field comparison and may be incorporated into the Work after completion of the review process and within limitations of keying requirements. Compliance with other requirements is the responsibility of the Contractor.
- C. Hardware Schedule: Submit, for Architect's information. Provide a detailed hardware schedule conforming with DHI's publication "Sequence and Format for Hardware Schedule", include in each door description: a door number consisting of the column grid location to the nearest tenth and drawing sheet number. Schedule the project in an orderly fashion, by floors or building section as defined by the Door and Hardware Schedule. Identify each item of hardware by including the Architect's hardware Set, and include the following:
  - 1. Type, style, function, size, label, hand, and finish of each door hardware item.
  - 2. Manufacturer of each item.
  - 3. Fastenings and other pertinent information.
  - 4. Explanation of abbreviations, symbols, and codes contained in schedule.
  - 5. Mounting locations for door hardware.
  - 6. Door and frame sizes and materials.
  - 7. Description of each electrified door hardware function, including location, sequence of operation, and interface with other building control systems.
- D. Templates: Submit for Architect's information. Submit with the supplier's hardware schedule, manufacturer's templates for each hardware item, properly identified and

marked with the Architect's Set Number in time for fabrication and installation. Furnish complete sets of manufacturer's templates with final hardware schedule to trades fabricating products to receive hardware.

- E. Wiring Diagrams: Submit, for Architect's information, Furnish wiring diagrams and product data, properly identified and marked with the Architect's identifying set, along with final hardware schedule, to the trades providing wiring, preparing products for installation and installing electrical hardware. Furnish a schematic diagram for each door equipped with electrical devices, showing connections, operation and relative locations of hardware and components.
- F. Keying Schedule: Submit for Architect's information. After reviewing project requirements with the Owner's representative, submit, as part of the final hardware schedule, a keying schedule conforming to the DHI publication "Keying Procedures, Systems and Nomenclature".
- G. Quality Control Submittals: Submit for Architect's information.
  - 1. Certificates
    - a. Document Review: Before commencing work, submit a written statement signed by the Contractor and the hardware Installer certifying that the Contract Documents, hardware schedule, keying schedule and product data have been reviewed with individual hardware manufacturers' qualified technical representatives and that they agree the selected hardware is proper and adequate for the applications shown.
    - b. Submit documentation of hardware supplier's qualification and certification of scheduling and coordinating personnel.
    - c. Submit product certificates signed by manufacturers of electrified door hardware certifying that products furnished comply with requirements.
    - d. Certifications that door hardware approved for use on types and sizes of labeled fire doors complies with listed fire door assemblies.
  - 2. Installer's Qualifications: Evidence of successful completion of work of similar scope to that shown and specified for this Project.
  - 3. Manufacturer's Qualifications: Evidence that the specified materials have been manufactured by the same source and successfully utilized for a minimum of 5 years on projects of a similar scope to that shown and specified for this Project.
- H. Closeout Submittals: Submit, for Owner's documentation.
  - 1. Warranties: Special warranties specified in this Section.
  - 2. Maintenance Manuals: Operation instructions and maintenance data for all items in accordance with Section 01 70 00 "Execution and Closeout Requirements". Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.



**1.6 QUALITY ASSURANCE**

**A. Qualifications:**

1. **Product Qualification:** Provide hardware of each category from a single manufacturer. Specified manufacturers and their product catalog numbers establish the standard of quality and design required for the various categories, and equivalent products by other manufacturers may be acceptable, subject to Architect's review of their equivalency.
  - a. No names, designs, or labels will be permitted to be exposed on the following items: Face of cylinders, turnpieces or operating trim of lock sets or latch sets, push bars, pull handles, plates, case covers of surface applied closing devices, underside of door holder arms, and exit devices.
  - b. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated. Manufacturers that are listed to perform electrical modifications, by a testing and inspecting agency acceptable to authorities having jurisdiction, are acceptable.
2. **Hardware Supplier's Qualification:** The company furnishing hardware for this project shall have been regularly engaged for 5 years in the sale and distribution of hardware for projects of comparable size and scope. The person responsible for overseeing the scheduling, detailing, ordering and coordinating of hardware shall be a certified AHC or DAHC of the Doors and Hardware Institute, and shall be available for consultation with the Architect, at no additional cost to the Owner, during progress of construction.
3. **Electrified Door Hardware Supplier Qualifications:** An experienced door hardware supplier who has completed projects with electrified door hardware 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, and who is acceptable to manufacturer of primary materials. Prepare 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. Regulatory Requirements:** Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from such authorities. Where hourly fire ratings are shown for openings, furnish hardware complying with the requirements of governing codes and regulatory agencies.

1. **Fire-Rated Door Assemblies:** Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.  
Test Pressure: Test at atmospheric pressure After 5 minutes into the test, neutral pressure level in furnace shall be established at 40 in. (1016 mm) or less above the sill.

**C. Pre-Submission Meeting:** Prior to submission of Hardware Schedule, arrange a meeting, attended by Contractor, Architect, Subcontractor, Manufacturers' representatives, Security Consultant and any other subcontractors whose work requires coordination with

this Work. At this meeting review product selections, submittal requirements and coordination of the Work with other trades.

- D. Pre-Installation Meeting: Prior to the start of the Work meet at the Project site to review methods and sequence of hardware installation, special details and conditions, standard of workmanship, job organization and other pertinent topics related to the Work.
- E. Hardware Installation Training: After delivery of hardware to project site, but before installation of the hardware, coordinate and schedule hardware installation training. The training will be conducted on the installation of locksets, door closers, exit devices, overhead stops and electromechanical hardware. The manufacturer's representative for each of the above product categories shall conduct the training on the job site with the installers of wood, hollow metal and aluminum doors in attendance. Any installer working with low voltage wiring of electromechanical hardware shall be in attendance.
- F. Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door hardware operation. Provide parts and supplies as used in the manufacture and installation of original products.

#### **1.7 DELIVERY, STORAGE AND HANDLING**

- A. Delivery of Hardware: Deliver hardware at the job site in the manufacturer's unopened labeled containers, marked with the opening number and the Architect's identifying Hardware Set. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
- B. Storage of Hardware: Store in a clean, dry, lockable secure space so that hardware will be free of damage at the time of installation.
- C. Delivery of Keys
  - 1. Deliver construction masterkeys with locksets.
  - 2. Place sets of change keys in suitable envelope tagged and marked with the change number and door designation. Deliver change keys in key control cabinet. Send masterkeys, grand-masterkeys and great grand-masterkeys directly to the Owner by registered mail.

#### **1.8 WARRANTIES**

- A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Warranty for Hardware: Submit a (3) three year written warranty, executed by each manufacturer agreeing to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:
  - 1. Structural failures including excessive deflection, cracking, or breakage.



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2. Faulty operation of operators and door hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
- C. Special Warranty Period for Exit devices: 5 years from date of Substantial Completion.
- D. Special Warranty Period for Electromagnetic Delayed-Egress Locks: 5 years from date of Substantial Completion.
- E. Special Warranty Period for Manual Closers: 10 years from date of Substantial Completion.
- F. Special Warranty Period for Concealed Floor Closers: 5 years from date of Substantial Completion.

### 1.9 MAINTENANCE

- A. Surplus Material: Turn over to the Owner at project completion surplus material, including screws, fasteners and special installation tools furnished with the hardware.
- B. Extra Stock
  1. Hardware: Furnish 2% additional of each of the following items of hardware required on the project, but not less than one of each item. Deliver additional hardware directly to the Owner.
    - a. Hinges
    - b. Pivots
    - c. Floor Closers
    - d. Locksets and Latchsets
    - e. Surface Closers
    - f. Stops
  2. Fasteners: Furnish three dozen additional screws and other fasteners of each type, size and finish used with the hardware items. Deliver additional screws and fasteners directly to the Owner.

## PART 2 - PRODUCTS

### 2.1 DOOR HANGING ITEMS

- A. General: Furnish door hanging items in quantities and sizes conforming to manufacturer's recommendations for door weight, height, width and thickness, and furnish U.L. listed items for labeled doors.
- B. Hinges - Full Mortise Concealed Ball Bearing: BHMA A156.1; Standard and heavy weight template hinges with three-knuckle, concealed vertical and thrust anti-friction type bearing at both joints.
  1. Non-rising pins, flat button or flush tips unless otherwise specified. Stainless steel pins in non-ferrous bearing hinges. Non-removable pins for outswinging security

doors and outswinging exterior doors.

2. Special swaged hinges where doors are set back in jamb.
3. Furnish fully concealed circuit, tamper-resistant, wired hinges at doors requiring power transfer from jamb to door. Furnish junction box and mortar shield for use with each electric concealed wired hinge and ship directly to the hollow metal manufacturer for installation on frame.
4. Butt Hinge Sizes for 1-3/4 in. (38mm) Door Thickness:

Door Width	Hinge Size (H x W)
36 in. (914mm) and less	4-1/2 in.(114mm) x 4 in.(100mm) or 4-1/2 in.(114mm)
37 in. (940mm) to 41 in. (1040mm) (114mm)	5 in. (125mm) x 4 in. (100mm) or 4-1/2 in.
42 in. (1070mm) to 47 in. (1200)	5 in. (125mm) x 4-1/2 in. (114mm)

5. Acceptable Manufacturers: Provide hinges from one of the following manufacturers for the entire project:
  - a. McKinney
  - b. Stanley
  - c. Hager
  - d. Bommer
  - e. Ives

- C. Sliding Door Track: BHMA A156.14; Provide as a complete set, including track, trolleys, brackets, floor guides, concealed floor sheaves and wheels and other items required for a complete installation.

Catalog Number	Mfr.
"1210/1230"	(Grant)
"A9110 Series"	(Hager)

- D. Pivots

1. Description: BHMA A156.1; Sets, weight and quantity to suit manufacturer's recommendations for door weight, height, width and thickness, with extended spindles where to suit door under-cut, floor finish or other special conditions, 1-1/2 in. (38mm) offset and special pivot layout where condition requires, UL listed pivot sets for labeled doors.
2. Pivot Sets - Offset Hung: Top and bottom standard, heavy and extra heavy weight, bottom arm of steel with plated wrought cover. Full mortise top pivot and floor plate of cast brass or bronze and steel for fire rated doors.
  - a. Acceptable Manufacturers: Provide offset hung pivot sets from one of the following manufacturers for the entire project:

- 1) Rixson
    - 2) Dorma
    - 3) Ives
  3. Intermediate Pivots - Offset Hung: Cast brass or bronze and steel for labeled doors. Screw pattern layout to straddle lead-lining of door. Furnish where required fully concealed circuit, tamper-resistant wired pivots at doors requiring power transfer from jamb to door. Furnish junction box and mortar shield for use with each electric concealed wired hinge and ship directly to the hollow metal manufacturer for installation on frame. Furnish where required intermediate offset pivots as part of set with floor and overhead concealed closer or top and bottom pivot sets.
    - a. Acceptable Manufacturers: Provide offset hung intermediate pivots from one of the following manufacturers for the entire project:
      - 1) Rixson
      - 2) Dorma
      - 3) Ives
  4. Pivot Sets - Center Hung: Adjustable "walking-beam" top pivot with needle bearing of steel with brass or bronze plated cover. Bottom pivot arm of steel and ball bearing floor plate of brass or bronze. Furnish fully concealed circuit, tamper-resistant wired top pivot at doors requiring power transfer from jamb to door.
    - a. Acceptable Manufacturers: Provide center hung pivot sets from one of the following manufacturers for the entire project:
      - 1) Rixson
      - 2) Dorma
      - 3) Ives
- E. Pivot Floor Closers
1. Description: BHMA A156.4; Shallow or full depth floor closers (offset hung, center hung, independently hung, electromagnetic hold open and pair in one case) with full controls, latching, closing speed and hydraulic backcheck with positive stop. Furnish selective hold open (S.H.O.) or automatic hold open (A.H.O.) where called for, with delayed action (DA) and handicapped access requirements (HC). Include appropriate top and intermediate pivot. Size closer to suit manufacturer's recommendations for door weight, height, width and thickness, providing standard duty, heavy duty and extra heavy duty where required.
    - a. Furnish cement case with temporary cover plate of steel or black iron for protection until the completion of floor finishing. Replace with a permanent heavy gage coverplate matching specified finish or a cover pan for use at areas having travertine, stone and other hard surface

floors as detailed.

- b. Furnish extended spindles with floor pan where required for special head and floor conditions. Furnish 1-1/2 in. (38mm) offset and special layout for pivot set where required by detail. Provide concealed fasteners and no-visual adjustment screws. Furnish UL listed pivots for labeled doors.
  - c. Acceptable Manufacturers: Provide pivot floor closer sets from one of the following manufacturers for the entire project:
    - 1) Rixson (exterior and interior)
    - 2) Dorma (interior only)
- F. Overhead Closers - Concealed: BHMA A156.4; Center and offset hung door closers with full controls, closing and latching speed for single and double acting and hydraulic backcheck on single acting doors. Hold-open "H.O." where called for. Size closer as recommended by manufacturer.
- 1. Closers shall be installed so that closer bodies are positioned on room side of doors to and from corridors, i.e., in-swing doors shall be track arm. Out-swing doors shall have a extra heavy duty parallel arm. Parallel arm shall be used on connecting doors between rooms.
  - 2. Closers shall comply with UL 10C requirements for positive pressure testing.
  - 3. Horizontal narrow profile body design for mounting in a 1-3/4 in. (44mm) x 4 in. (100mm) header of hollow metal, wood or aluminum construction. Provide suitable mounting and hanging devices for door, frame, floor and threshold conditions. Furnish cover plate to match specified finish.
  - 4. Use center pivoting arm for center hung conditions and slide channel arm for offset hung. Furnish bottom arm and ball bearing floor pivot plate for center hung closers. furnish extended spindles where required for special head and floor conditions. Furnish special layout for pivot set as required by detail for independently hung closers. Furnish UL listed pivots for labeled doors.
  - 5. Acceptable Manufacturers: Provide center hung pivot sets from one of the following manufacturers for the entire project:
    - a. Rixson
    - b. Dorma
    - c. Jackson

## **2.2 DOOR LOCKING ITEMS**

- A. Locks General: Locksets, and latchsets, regardless of trim, shall be listed by UL for labeled doors.
  - 1. Furnish special backsets where lock stiles are too narrow for backset of locks specified. Furnish extended strikes where doors are set back on jambs. Furnish wrought, box type strike plates or standard construction, or curved face strike

plates on round edge doors. Locks shall be for door thicknesses shown.

**2. Cylinders**

- a. Furnish cylinders by one manufacturer for locks requiring cylinders.
- b. Furnish 7 pins, removable core, high security, brass cylinders. Mortise and rim having a head cap of brass, bronze or stainless steel finished to match the lock trim.
- c. Furnish mortise, rim and cylindrical type cylinder with proper tail piece.

**B. Mortise Locksets and Latchsets: BHMA A156.13; Heavy duty type with heavy gage, corrosion resistant steel case, 2-3/4 in. (70mm) backset, through bolted. adjustable armored front or rabbeted faceplate at rabbeted doors. Conceal fastenings, washers and bushings.**

1. Two-piece anti-friction latchbolt of 3/4 in. (19mm) throw with auxiliary deadlatch and a deadbolt of 1 in. (25mm) throw with hardened steel inserts where scheduled.
2. Strike plate ANSI Standard A115.1 with curved lips of sufficient length to protect frames, include wrought, or black plastic, box. Extended lip strike where doors are set back in jamb, open back strike when required, rabbeted strike at doors with rabbeted stiles.
3. Mortise Lock Trim: With reference to the "Lock Series" described below, the following acceptable manufacturers and their trim designs as noted are acceptable as equivalent to each other:

**Lever Trim**

Schlage	Sargent	Best	Corbin Russwin
01A	LNE		
02A	LNW	12H	
03A		3H	03A
05A	LNF		
06A	LNL	15H	NSA
07A	LNB	16H	CSA/ASA
12A	LNF	17H	DSA
17A	LNP	14H	PSA
93A	LNJ	33H	LWA

**C. Mortise Locksets -Electronic Solenoid Operated: Heavy duty mortise lock with 24 VAC electronic, solenoid operated deadlocking latchbolt, Fail-Safe (FS) or Fail-Secure (FSE) where required by the Architect's Set. Include key override feature. Furnish necessary power supply, transformers and rectifiers. Provide electronic solenoid operated mortise locksets from same manufacturer as regular mortise locksets and latchsets.**

**D. Miscellaneous Locks**

1. Bottom Rail Deadlock: Mortise type deadlock with round projecting deadbolt for bottom rail.



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Catalog No.:                      Manufacturer:  
"MS1861-01"                      (Adams Rite)

2.      Narrow Stile Deadlock and Deadlatch: Mortise type, for narrow stile doors, with armored face.

- a.          Deadbolt of five-ply laminated steel, turnpiece cylinder inside when required.
- b.          Latchbolt of bronze with hardened steel inserts, 5/8 in. (16mm) throw and auxiliary deadlocking bolt. Furnish with latch paddle on inside.

Catalog Number                      Manufacturer  
"MS-1850A"                      (Adams-Rite)  
"2851/2855"                      (Yale)  
"8506 Series"                      (Assa)

3.      Deadlatch, narrow stile

Catalog Number                      Manufacturer  
"4810 x4590"                      (Adams-Rite)  
"2853/2856"                      (Yale)  
"8516 Series"                      (Assa)

4.      Sliding Door Lock: Mortise type sliding door lock, with a flat brass armored faceplate and a mortise type strike. A throwbolt of 3/4 in. (19mm) throw with stainless steel horizontally expanding dogs.

Catalog No.:      Manufacturer:  
"2331"                      (Adams-Rite)

5.      Roller Latch: Drop forged bronze body with an adjustable rubber roller. Where positive stop is required by Architect's Code, furnish with integral single stop with two rubber silencers.

Catalog No.                      Manufacturer  
"RL-30"                      (Ives)  
"93"                      (Quality)  
"1193"                      (Builders Brass Works)

Roller Latch - Positive Stop

Catalog No.                      Manufacturer  
"RL-1152 with SK1017 Strike"                      (Ives)  
"1195"                      (Builders Brass Works)

6.      Cipher Digital Lock: Heavy duty keyless lock with 5 button system with master key bypass capability, 2-3/4 in. (70mm) backset and lever handle. Deadbolt of brass with hardened steel inserts, 3/4 in. (19mm) throw. Provide removable key cores as required to complete installation.

Catalog No.                      Manufacturer





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"Unican L1000-2" (Simplex Security Systems, Inc.).  
"DL2500 Series" (Alarm Lock Systems, Inc.).  
"Cobra" (Locknetics).

**E. Flushbolts**

1. Manual Flushbolts: BHMA A156.16; Spring loaded snap action lever type with 1 in. (25mm) wide faceplate of extruded brass or bronze. Faceplate for metal doors fits ANSI Standard A115 specification and aluminum doors with radius or face as required with rounded corners.

**U. L. Listed**

Metal Catalog No.	Wood Catalog No.	Manufacturer
"FB458" "1358-UL"	"FB358"	(Ives) (Quality)

**Not U.L. Listed**

Metal Catalog No.	Wood Catalog No.	Aluminum Catalog No.	Manufacturer
"FB458N"	"FB258N"	"FB258N"	(Ives)

2. Automatic and Self-Latching Flushbolts: BHMA A156.3; with 1 in. (25mm) wide faceplate of extruded brass or bronze with door fitting ANSI Standard A115 specification. Automatic has full engagement or disengagement and automatic latching of bolt. Self-latching with manual disengagement and automatic latching of bolt. UL listed for labeled doors.

Automatic Type		Self-Latching Type		Mfg.
Metal Catalog No.	Wood Catalog No.	Metal Catalog No.	Wood Catalog No.	
"FB-31P"	"FB-41P"	"FB-51P"	"FB-61P"	(Glynn- Johnson)
"FB-31P" "840"	"FB-41P" "940"	"FB-51P" "845"	"FB-61P" "945"	(Ives) (Door Controls)

3. Flushbolt, Cylinder-Operated: Narrow stile mortise lock operated flushbolts. Furnish armored faceplate, wood doors provided with an extended faceplate. Furnish turnpiece cylinder on inside when required; keyed cylinder conforming to project's "Keying System".

Metal Doors Catalog No.	Wood Doors Catalog No.	Mfg.
"1870HM"	"1877"	(Adams Rite)

4. Surface Bolts: BHMA A156.16; jimmy resistant, automatic lock and mounted with concealed screws.

Catalog No.	Mfg
"SB1600"	(Ives)

- F. Exit Devices - Touch Bar Type: BHMA A156.3, Grade 1; Low profile design, standard series or narrow stile series as required with devices of one manufacturer. Comply with



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the following:

1. Required rated exit devices shall be UL listed for both accident hazard panic and fire labeled doors. Furnish exit devices that are approved and suitable for use with labeled doors with 3/4 in. (19mm) undercut. Non-labeled exit devices shall be UL Listed for accident hazard panic only.
2. Furnish outside operators with lever trim. Avoid through-bolting of device, if through bolts are visible. Where lever trim is specified, levers shall match balance of project. Lever return springs shall be compression type. Extension springs and/or torsion springs will not be accepted. Cylinders shall be recessed from face of escutcheon.
3. Furnish security dead latching for exit device latches (rim, mortise, surface vertical rod and concealed vertical rod).
4. Furnish exit devices, less bottom rod, on cross corridor pairs of doors, where doors are for compartmentation only.
5. Furnish hydraulic sound dampening on exit devices.
6. Alarmed (ALR) exit devices shall have remote horn or a alarm kit built in to the devices with a signal switch (SS) for activating the remote horn and remote monitoring of latchbolt and touch bar or (RX) for release exit switch. Key switch override and reset inside and out.
7. Electric latch retraction (EL) on rim, mortise and concealed vertical rod devices shall be Fail- $\rightarrow$  Secure. Electric, solenoid operated, mortise or rim lock device with outside trim shall be either locked when electrically energized and Fail-Safe (FS) or unlocked when electrically energized and Fail-Secure (FSE). Devices shall be 24VDC.
8. Include power supply, electric power transfer unit of suitable voltage for devices that requires electrical power.

9. Standard Touch Bar Series

Concealed Vertical Rod Type	
Catalog Number	Mfg.
"9947 Series x Trim"	(Von Duprin)
"1800 Series x Trim"	(Precision)

10. Narrow Stile Touch Bar Series:

Concealed Vertical Rod Type	
Catalog Number	Mfg.
"3347 Series x Trim"	(Von Duprin)
"5300 Series x Trim"	(Dorma)

**2.3 ACCESSORIES ITEMS**

- A. Coordinators: BHMA A156.3.

Bar Type	Gravity Arm Type	
Catalog Number	Catalog Number	Mfg.
"COR Series"	"COR G Series"	(Ives)
"600 Series"	----	(Door Controls International)

- B. Carry Bars: To protect astragal and other hardware if inactive leaf is opened first. Vertical x mortise lock exit devices only.

Catalog Number	Mfg.
"CB-1"	(Ives)
"100"	(Door Controls International)

- C. Dustproof Strikes: Wrought brass with spring loaded strike cover plate and with round or rectangular hole compatible with the bolt of the device involved.

Round Hole Type	Rectangular Hole Type	
Catalog No.	Catalog No.	Mfg.
"DP-2"	----	(Ives)
"80"	----	(Door Control)
-----	"8790"	(Accurate Lock and Hardware)

- D. Electric Strikes: For use with mortise and cylindrical locks and rim and concealed vertical rod exit devices. Frame cutouts for mortise and cylindrical lock strikes conform to the ANSI A115.3. Faceplate of brass, bronze or stainless steel, locking components of stainless steel, solenoids of the continuous duty type Fail-safe (FS) or Fail Secure (FSE) with signal switch for monitoring. 24 VDC operation, S.O. Silent Operation, UL listed as Burglary-Resistant. Electric Door Strike and where required shall be UL listed as Electric Strikes for Fire Doors. Ship mortar and wire box for strike/frame locations directly to the hollow metal manufacturer for installation on frame.

**For Mortise or Cylindrical Lock**

Single Doors	Double Doors	
Catalog No.	Catalog No.	Mfg.
"6211 Series"	"6221 Series"	(Von Duprin)
"712 Series"	"712 Series"	(Folger Adam Co.)

For Exit Device	For Exit Device	
Rim Type	Concealed Vertical Rod	
Catalog No.	Catalog No.	Mfg.
"6111 Series"	-----	(Von Duprin)
"310-4"	"310-6-8"	(Folger Adam Co.)

- E. Dummy Trim: Design and finish to match latchset/lockset trim.

- F. Push Plates: Wrought brass, bronze or stainless steel of 0.050 in. (1.3mm) plate, 4 in. (100mm) wide and 16 in. (400mm) height with edges beveled. Provide push plates from one of the following for the entire project:

1. Rockwood

2. Trimco
  3. Ives
- G. Wire Pull with Plates: Stainless steel, 1 in. (25mm) dia., 10 in. (250mm) center to center with concealed mounting, 0.050 in. (1.27mm) plate, 4 in. (100mm) wide and 16 in. (400mm) high with edges beveled. Provide push plates from one of the following for the entire project:
1. Rockwood
  2. Trimco
- H. Wire Pulls: Stainless steel, 1 in. (25mm) dia., 10 in. (250mm) o.c. with concealed mounting. Provide push plates from one of the following for the entire project:
1. Rockwood
  2. Trimco
  3. Ives
- I. Push Pull Bar Set: Brass, bronze or stainless steel, 1 in. (25mm) dia. bar, each unit consisting of one push bar on inside attached to one 10 in. (250mm) o.c. offset pull on outside, with concealed back-to-back mounting. Provide push pull bar sets from one of the following for the entire project:
1. Rockwood
  2. Trimco
  3. Ives

## **2.4 DOOR CLOSERS**

- A. Overhead Surface Closers: BHMA A156.4; One grade for both interior and exterior doors, by one manufacturer, matched in design with high impact-resistant non-corrosive cover-
1. Spring power size adjustment from size 1 through size 5 with independent valves regulating sweep and latching speed, fully adjustable backcheck cushioning control. -
  2. In the absence of specific instructions detail and mount closer on the side of the door away from the corridor or public space by using a parallel arm application on in swing doors.
- |                |           |
|----------------|-----------|
| Catalog Number | Mfg.      |
| "281"          | (Sargent) |
| "7500/7700"    | (Norton)  |
| "4111/4011"    | (LCN)     |
| "8901"         | (Dorma)   |
- B. Fully Concealed Closers: BHMA A156.16; With full controls, two independent valves for



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latching and closing speed with a third valve for back check adjustment, with (H.O.) where called for, size to suit door size and location.

1. Mortised in the door, with arm and body not visible in the closed position, body capable of being installed in a 1-3/4 in. (19mm) wood door without the use of reinforcing plates.

Track Slider Arm - N.H.O.

Track Slider Arm - H.O.

Catalog Number  
"3130"

Catalog Number  
-----

Mfg.  
(LCN)

2. Mortised in the frame head, with arm and body not visible in the closed position, with suitable mounting devices for door and frame, with coverplate to match specified finish.

Track Slider Arm - N.H.O.

Track Slider Arm - H.O.

Catalog Number  
"2010"  
"268"

Catalog Number  
-----  
-----

Mfg.  
(LCN)  
(Sargent)

- C. Surface-Mounted Electro-Mechanical Closers - Power Track Holder - add suffix DA to indicate door for handicapped use

With integral smoke detector, push side: Companion unit, push side:

Catalog Number  
"12-2497"  
"P7700 PTD"  
"TS83EMR/PT"

Catalog Number  
"9-2497"  
"P7700 PTS"  
"TS83EMF/PT"

Mfg.  
(Sargent)  
(Norton)  
(Dorma)

Use with remote smoke detector, push side:

Catalog Number	Mfg.
"2497"	(Sargent)
"P7700 PTS"	(Norton)
"TS83EMF/PT"	(Dorma)

With integral smoke detector, pull side: Companion unit, pull side:

Catalog Number  
"12-2467"  
"7700 PTD"  
"TS83EMR T"

Catalog Number  
"9-2467"  
"7700 PTS"  
"TS83EMR T"

Mfg.  
(Sargent)  
(Norton)  
(Dorma)

Use with remote smoke detector, pull side:

Catalog Number	Mfg.
"2467"	(Sargent)
"4040 SE"	(LCN)
"7700 PTS"	(Norton)
"TS83EMFT"	(Dorma)

- D. Concealed Electro-Mechanical Closers - Power Track Holder - suffix DA indicates door for handicapped use.

Use with remote smoke detector  
Mount in door

Use with remote smoke detector  
Mount in frame head

Catalog Number  
"3130SE"

Catalog Number  
"2310ME" Mfg.  
(LCN)

- E. Surface-Mounted Electro-Mechanical Closers - Free Swing - suffix DA indicates door for handicapped use.

With integral smoke detector, pull side: Companion unit, pull side:

Catalog Number  
"P7700 PTD"  
"4210MPDS-CFS"  
"HO170T/FS171T"

Catalog Number  
"P7700 PTS"  
"4210MESS-CFS"  
"HO165t/FS165T" Mfg.  
(Norton)  
(Yale)  
(Dorma)

Use with remote smoke detector, pull side:

Catalog Number  
"4310ME-SF"  
"P7700 PTS"  
"4210MPSS-CFS"  
"TS83EMF PT" Mfg.  
(LCN)  
(Norton)  
(Yale)  
(Dorma)

## **2.5 DOOR STOPPING AND HOLDING ITEMS**

- A. Floor Stops: ANSI/BHMA 156.16

1. For each door except where floor stops may create a traffic hazard, where 50% of the door width projects beyond the point of contact with adjacent construction or where exterior swing doors open outwards from building.
2. Heavy duty cast brass, bronze or stainless steel, with non-marring rubber bumper; provide risers in carpeted areas and elsewhere as required, complete with attachment hardware to suit floor substrate. Provide floor stops from one of the following for the entire project:
  - a. Rockwood
  - b. Trimco
  - c. Ives

- B. Wall Stops: ANSI/BHMA 156.16

1. For doors in locations where floor stop would be appropriate but floor anchors would conflict with waterproofing or under-floor duct.
2. Heavy duty cast brass, bronze or stainless steel, with non-marring, tamper proof rubber bumper; provide appropriate attachment hardware to suit base and wall condition-Provide push pull bar sets from one of the following for the entire

project:

- a. Rockwood
- b. Trimco
- c. Ives

C. Angle Head Stops: Drop-forged brass or bronze with two rubber mutes.

Single	Double	
Catalog Number "84-1"	Catalog Number "84-1"	Mfg. (Accurate Lock and Hardware Co.)
"AS-18"	"AS-18"	(Ives)
"1217P"	"1217P"	(Trimco)

D. Roller Latch and Angle Head Stop: Drop-forged brass or cast brass or bronze with a rubber roller and rubber mute.

Catalog Number "RL1152"	Mfg. (Ives)
"593"	(Rockwood)

E. Overhead Stops and Holders: Extruded bronze channel, arm and bracket with tempered steel shock absorber spring.

Concealed for Interior and Exterior Use		
Standard Duty	Heavy Duty	
Catalog Number "3 Series"	Catalog Number "1 Series"	Mfg. (Rixson)
"GJ- 410"	"GJ-100"	(Glynn-Johnson)
"1530"	"690"	(Sargent)
"300 Series"	"100 Series"	(Yale)
Surface Applied for Interior and Exterior Use		
Standard Duty	Heavy Duty	
Catalog Number "33 Series"	Catalog Number "9 Series"	Mfg. (Rixson)
"GJ- 450"	"GJ-90 Series"	(Glynn-Johnson)
"1540"	"590"	(Sargent)
"DH5200"	-----	(Corbin/Russwin)

## 2.6 MISCELLANEOUS ITEMS

A. Protective Plates: BHMA A156.6; For single doors, 2 in. (50mm) less than the door width on stop side, 1 in. (25mm) less than the door width on hinge side. For pairs of doors 1 in. (25mm) less than the leaf width. 0.050 in. (1.3mm) thick stainless steel, beveled 4 edges (B4E), drilled and countersunk to receive Phillips flat head screws with heads finished to match plate finish. Provide protective plates from one of the following for the entire project:



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1. Rockwood
2. Trimco

**NTS:** The following are PVC type protective plates.  
Modify and edit as required.

- B. Protective Plates: BHMA A156.6; Furnish mop, kick, stretcher and armor plates of 0.060 in. (1.5mm) thick semi-rigid vinyl/acrylic sheet material and bevel 4 sides. Drill and countersink plates for self-tapping oval head screws. Furnish height of plates for mop and kick plates at 10 in. (250mm), stretcher plates at 12 in. (305mm) and armor plates at 32 in. (813mm) Width for single doors, 2 in. (50.8mm) less than the width on stop side, 1 in. (25mm) less than the width on hinge side. Width for pairs of doors 1 in. (25mm) less than the width. Where hardware is surface applied, reduce the width by 4 in. (100mm).  
Catalog number and acceptable manufacturers:

1. "Acrovyn" (Construction Specialties, Inc.) or approved equal.

- C. Silencers: BHMA A156.16; 3 each for single doors, 2 each for pairs of doors and 4 each for Dutch doors, type to suit frame condition.

**Metal Frame**

**Wood Frame**

Catalog Number  
"SR-64"

Catalog Number  
"SR-65"

Mfg.  
(Ives)

- D. Electromagnetic Holders: BHMA A156.15; Energized at all times unless electric current is interrupted or if magnetic contact is broken by manual pull on door. Provide strike with a universal ball joint for self-aligning both vertically and horizontally. See Division 16 Section "Fire Protection" for smoke detection and programming specification.

Catalog Number  
"980-999 Series"

"7800 Series"

"390, 1501, 1503 Series"

"DH57900"

"EM504-EM501 Series"

Mfg.

(Rixson)

(LCN)

(Sargent)

(Corbin, Russwin)

(Dorma)

- E. Gasketing and Door Bottoms: BHMA A156.22; Extrusion or solid block of aluminum alloy 6063-T5 with silicone, neoprene, polypropylene or vinyl bubble or pad. Gasketing shall be UL listed for use on labeled doors. Provide gasketing, door bottoms and associated hardware as produced by one manufacturer for the entire project. Provide gasketing and door bottoms from one of the following:

1. Pemko
2. National Guard
3. Reese
4. Zero International

- F. Saddles and Thresholds: BHMA A156.21; Extrusion of aluminum alloy 6063-T5 with



neoprene or vinyl seals when specified. Saddles and thresholds shall be provided with manufacturers' standard slip-resistance surface. Provide saddles and thresholds and associated hardware as produced by one manufacturer for the entire project. Provide saddles and thresholds from one of the following:

1. Pemko
  2. National Guard
  3. Reese
  4. Zero International
- G. Hardware Attachment Devices: Provide Phillips head type screws and bolts with exposed surface finished to match adjacent surface. Use the following fasteners for application to the substrates shown:
1. Machine screws and bolts for application to metal.
  2. Wood screws with full thread for application to wood.
  3. Sheet metal screws for application to particleboard or plywood. Screws for use in fire retardant particleboard or plywood shall be of stainless steel.
  4. Machine screws and galvanized tamper-in shields for application to concrete or masonry.
  5. Through bolting will not be permitted except in special cases at the Architect's discretion. Provide internal reinforcement to accept bolts concealed from the outer face of door.

## **2.7 FABRICATION**

- A. Manufacturer's Nameplate: Do not provide manufacturers' products that have manufacturer's name or trade name displayed in a visible location (omit removable nameplates) except in conjunction with required fire-rated labels and as otherwise approved by Architect. Manufacturer's identification will be permitted on rim of lock cylinders only.
- B. Base Metals: Produce door hardware units of base metal, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18 for finishes. Do not furnish manufacturer's standard materials or forming methods if different from specified standard
- C. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for concealed (where possible) machine, wood, and sheet metal screws. Provide screws according to commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated
- D. Adapt hardware to compensate for door under-cutting and special conditions. Furnish manufacturer's written installation instructions and special tools, and screws, bolts and

other fastening devices needed for installation for each pieces of hardware

## 2.8 KEYING AND KEY CONTROL SYSTEM

- A. Keying General: The general requirements for the keying system will be determined by the Owner. Meet with the Owner's representative to review and finalize the keying requirements before submitting Keying Schedule. Generally key alike the following categories:
1. Doors entering into the same space.
  2. Doors to mechanical spaces.
  3. Doors to electrical spaces.
  4. Doors to telecommunication equipment spaces.
  5. Doors from the exterior to corridors and lobbies.
  6. Doors to mechanical, electrical, telecommunication and janitor's spaces are passed by the building engineering key.
- B. Keying System: Furnish a new system having, removable core cylinders with "Visual Key Control, patented, time zone restricted keyway by one manufacture (and be the same as the lock manufacturer). Furnish temporary cores (or cylinders) during construction, replacing them with factory masterkeyed, cores (or cylinders) conforming to the Owner's needs. Furnish one copy of the Bitting List by registered mail to the Owner.
- C. Keying System at existing doors: Confirm cores are capable of being rekeyed. If not Furnish new locksets with removable core cylinders with keyway suitable for keying to Owner's existing.
- D. Keys: Furnish keys of nickel silver by cylinder manufacturer, stamp with "*Visual Key Control*" and "*Do Not Duplicate*" only. Furnish keys in the following quantities:
- |                             |                              |
|-----------------------------|------------------------------|
| 1. Change keys              | 3 keys each cylinder         |
| 2. Masterkeys               | 2 keys each master           |
| 3. Grand masterkeys         | 3 keys each grandmaster      |
| 4. Great grand-masterkeys   | 2 total                      |
| 5. Construction masterkeys  | 10 total                     |
| 6. Change key blanks        | 20 for each different keyway |
| 7. Removable core cylinders | 10 total                     |
- E. Key Control System: Provide a key control identification system, including a wall mounted steel cabinet, finished with baked enamel, with capacity to contain all keys, plus approximately 50%, key envelopes, key tags numbered from 1 up and an indexing and register system. Acceptable manufacturers: Key Control System, Inc., Lund Equipment Co., Inc and Telkee, Inc. Provide the following services in conjunction with the key control system:
1. Set up and installation of the key control system.
  2. Instruction of the Owner's personnel in the operation of the key control system.

3. Check the system 6 months and one year after substantial completion to verify its operation.

## **2.9 FINISHES (BHMA Designations)**

- A. Standard: Comply with BHMA A156.18. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Finish equivalences and description:
  1. 600 - Prime coat (USP)
  2. 612 - Satin bronze clear coated (US10)
  3. 613 - Satin bronze, oxidized and oil rubbed (US10B)
  4. 629 - Bright stainless steel (US32)
  5. 630 - Satin stainless steel (US32D)
  6. 639 - Satin bronze plated on steel, clear coated (10)
  7. 640 - Oxidized stain bronze plated over copper plate on steel, oil rubbed (10B)
  8. 690 - Sprayed dark statuary bronze coating
  9. 691 - Sprayed dull bronze coating
  10. 693 - Sprayed black coating

## **PART 3 - EXECUTION**

### **3.2 GENERAL**

- A. General: Hardware requirements set forth in the Section 08 70 10 "Hardware Set Schedule" and Section 08 06 10 "Door Schedule" shall not be construed as a complete hardware schedule but only as an indication of the hardware requirements. Hardware shall be suitable and adaptable for its required use and shall fit its designated location. Examine the Drawings and door hardware sets, and provide all necessary or additional hardware required with the same type and quantity as scheduled for similar doors used for similar purposes. Should specified hardware fail to meet the intended requirements or require modification to suit or fit the designated location, make the necessary correction or modification.
- B. Manufacturer's Instructions: Prepare substrates and install the work of this Section,

including equipment, components, and accessories in accordance with the manufacturer's instructions, except where more stringent requirements are shown or specified, and where project conditions require extra precautions or provisions to ensure satisfactory performance of the Work.

### **3.3 EXAMINATION**

- A. Verification of Conditions: Examine the areas to receive the Work and the conditions under which the Work would be performed. Contractor shall remedy conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

### **3.4 PREPARATION**

- A. Substrate Acceptability: Commencement of installation shall constitute acceptance of substrate conditions by the hardware Installer.
- B. Steel Doors and Frames: Comply with DHI A115 series.
  - 1. Surface-Applied Door Hardware: Drill and tap doors and frames according to SDI 107.
- C. Wood Doors: Comply with DHI A115-W series.
- D. NFPA Restrictions: Comply with NFPA 80 restrictions as related to on-site door preparation required for surface-applied door hardware, function holes for mortise locks, undercutting of doors, and protection plates.

### **3.5 COORDINATION**

- A. General: Coordinate layout and installation of recessed pivots and closers with floor construction. Cast anchoring inserts into concrete or masonry.
- B. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- C. Electrical System Roughing-in: Coordinate layout and installation of electrified door hardware with connections to power supplies, fire alarm system and detection devices, access control system, security system, building control system.

### **3.6 OBSERVATION**

- A. Provide the service of a qualified hardware consultant to make periodic checks during construction to determine that the hardware is properly installed and to check operation and installation of hardware and make adjustments required for smooth operation. maintenance of hardware and hardware finishes.

### **3.7 HARDWARE SET SCHEDULE**

- A. Refer to drawings for hardware sets listed for each door.

**3.8 HARDWARE INSTALLATION AND APPLICATION**

- A. General: Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, coordinate removal, storage and reinstallation or application of surface protection with the painting or other finishing work. Do not install surfaced-mounted items until finishes have been completed on the substrate. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation. Drill and countersink hardware not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- B. Hardware Mounting Locations: Locate certain hardware items as listed below unless otherwise required by governing regulations; mount other hardware items in accordance with DHI standards and/or as required by governing regulations.
1. Hinges: Position top hinge 5 in. (125mm) below head, bottom hinge 10 in. (250mm) above finished floor and intermediate hinges equally spaced between top and bottom hinges. For Dutch doors position hinges 5 in. (125mm) above and below split line.
  2. Floor Pivots: In carpeted areas, set floor pivot flush with substrate under carpet.
  3. Floor Closers: Install with cement cases; furnish twin cases at narrow mullions to permit back-to-back installation. In carpeted areas, set floor plate flush with substrate under carpet.
  4. Overhead Closer Concealed in Header: Concealed or exposed arm application as specified; surface shoe application for door closers with exposed arms.
  5. Locks and Latches: Unless otherwise shown locate center of door levers and/or knobs 38 in. (965mm) above finished floor.
  6. Dead Latches and Locks: Unless otherwise specified or detailed locate center of cylinder 48 in. (1.2m) above finished floor; in access doors, locate at midpoint.
  7. Flush Bolts: Locate flush bolts in edge of inactive door; position trip mechanism 72 in. (1.83m) from finished floor for top bolt and 12 in. (300mm) from floor for bottom bolt.
    - a. Strikes: Install dustproof strikes flush with finished flooring material or top of metal threshold.
  8. Exit Fixtures: Locate cross bar at height so that center of lever trim is 38 in. (965mm) above finished floor.
  9. Pull Plates and Push Plates: Unless otherwise specified or detailed, install with horizontal center line 45 in. (1.14m) above finish floor and with vertical line on center with backset specified for dead lock and latches; mount pull plates on pull side of door; mount push plates on push side of door.
  10. Overhead Closers: Verify each head condition prior to furnishing door closers.
    - a. Surface Mounted on Door: Surface shoe application for standard operation and soffit plate application for parallel arms, special shoe

plates and brackets to suit job conditions. Avoid the use of through bolts.

- 1) For hollow metal doors provide templating for internal tapped reinforcement.
- 2) For wood doors and mineral core fire doors provide hardware with machine screw fasteners to an approved reinforcement blocking.

- b. Surface Mounted Over Door: Surface shoe application.
- c. Concealed in Door: Surface shoe and soffit plate application as specified.

11. Protective Plates

- a. Kick Plates: Mount on push side of door.
- b. Mop Plates: Mount on pull side of door.
- c. Stretcher Plates: Where shown or at 42 in. (1.1mm) at center line of plate. Mount plate on push side.
- d. Armor Plates: Where shown, butt bottom edge of push plate to top edge of armor plate.

12. Electromechanical Hardware

- a. Wiring for electromechanical hardware mounted on the door shall connected through the power transfer and terminated in the interface junction box specified for in Division 26 "Electrical".
- b. Conductors shall be minimum 18 gauge (1.2mm) stranded, multicolored. A minimum 12 in. (300mm) loop of conductors shall be coiled in the interface junction box. Each conductor shall be permanently marked with its function.
- c. If a power supply is specified in the hardware sets, conductors shall be terminated in the power supply. Make connections required for proper operation between the power supply and the electromechanical hardware.

13. Electric door hardware shall be wired to its power supply; from where the Security Contractor can interface for proper operation. Each piece of electric door hardware shall be tested for mechanical and electrical operation prior release to the Security Contractor.

C. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant.

D. Weatherstripping and Seals

1. General: Provide continuous weather-strip gasketing on exterior doors (whether indicated or not) and provide smoke, light, or sound gasketing on interior doors where indicated or scheduled. Provide noncorrosive fasteners for all applications.

Install as follows:

- a. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
- b. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- c. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

### **3.9 ADJUSTING**

- A. General: Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units which can not be adjusted and lubricated to operate freely and smoothly as intended for the application made.
- B. Final Adjustment: Wherever hardware installation is made more than 1 month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance or occupancy, and make a final check and adjustment of hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.
- C. Defective or Inoperative Hardware: Where hardware is found defective or unable to operate freely and smoothly for the operation intended, repair or replace or otherwise correct as directed.

### **3.10 CLEANING**

- A. Cleaning: Clean adjacent surfaces soiled by hardware installation. Clean operating items as necessary to restore proper function and finish.

### **3.11 PROTECTION**

- A. Protection: Provide all items of hardware with proper protection from surrounding construction and at final completion, all hardware shall be left clean and free from disfigurement. Make a final adjustment to door closers and other items of hardware.

**END OF SECTION**

**SECTION 08 80 00  
GLAZING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. General: Provide glazing in accordance with requirements of the Contract Documents.
- B. Related Work Specified Elsewhere:
  - 1. Section 01 81 13 "Sustainable Design Requirements" for additional references, definitions, documentation requirements, action plans, meetings, and performance requirements of products and systems.
  - 2. Glass and metal railing assemblies are specified in Section 05 70 00 "Decorative Metal".
  - 3. Backerboards and concealed panel clips for mirror assemblies are specified in Section 06 10 00 "Rough Carpentry".
  - 4. Sealants and joint fillers are specified under Section 07 92 00 "Joint Sealants".
  - 5. Steel doors and frames scheduled to receive glass is specified under Section 08 11 13 "Hollow Metal Doors and Frames".
  - 6. Wood doors scheduled to receive glass is specified under Section 08 14 00 "Wood Doors".
  - 7. Entrance doors and storefronts is specified under Section 08 41 00 "Entrances and Storefronts".
  - 8. Curtain wall is specified under Section 08 44 00 "Curtain Wall and Glazed Assemblies".
  - 9. Aluminum windows are specified under Section 08 51 13 "Aluminum Windows".
  - 10. Skylights are specified under Section 08 63 00 "Metal-Framed Skylights".
  - 11. Framed mirrors are specified under Section 10 28 13 "Toilet Accessories".

**1.2 REFERENCES**

- A. General: Comply with the applicable provisions of the referenced standards except as modified by governing codes and the Contract Documents. Where a recommendation or suggestion occurs in the referenced standards, such recommendation or suggestion shall be considered mandatory. In the event of conflict between referenced standards, this specification or within themselves, the more stringent standard or requirement shall govern.
- B. Glass Association of North America (GANA)
  - 1. "Sealant Manual" and "Glazing Manual".



2. "Mirrors, Handle with Extreme Care, Tips for the Professional on the Care and Handling of Mirrors".
3. "Laminated Glass Design Guide".
- C. Glass Tempering Association (GTA): "Engineering Standards Manual".
- D. ASTM International (ASTM):
  1. ASTM C1036, "Specification for Flat Glass".
  2. ASTM C1048, "Specification for Heat Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass".
- E. Insulating Glass Manufacturer's Association (IGMA)
  1. Publication for Sloped Glazing: IGMA TB-3001, "Sloped Glazing Guidelines".
  2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units".
- F. American Architectural Manufacturers Association (AAMA)
  1. AAMA GDSG-1, "Glass Design for Sloped Glazing".
  2. AAMA TIR-A7, "Sloped Glazing Guidelines".
- G. Consumer Product Safety Commission (CPSC): Safety Glazing Standard: Where safety glass is indicated or required by authorities having jurisdiction, provide type of products indicated which comply with ANSI Z97.1 and testing requirements of CPSC 16 CFR Part 1201 for category II materials. Subject to compliance with requirements and local authorities having jurisdiction, provide safety glass with a removable certification label of Safety Glazing Certification Council (SGCC) or other certification agency acceptable to authorities having jurisdiction.

### **1.3 DEFINITIONS**

- A. Sloped Glazing: Sloped glazing is defined as glass tilted more than 15 deg. off the vertical.

### **1.4 SYSTEM DESCRIPTION**

- A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Related Requirements: Comply with requirements as related to glass and glazing specified in the following specification sections:
  1. Section 08 41 00 "Entrances and Storefronts".
  2. Section 08 42 29 "Automatic Sliding Doors"

- C. Performance Requirements: Glass thicknesses and heat treatment, if specified, are minimum requirements based upon manufacturer's regularly published literature. The Architect makes no representations as to the accuracy of the literature or the conclusions derived there from. Provide glass thicknesses and heat treatment (heat strengthened or fully tempered) in compliance with ASTM E1300, as required to meet specified design criteria, in-service conditions and the following:
1. Vertical Glass: For glass set vertically or less than 15° from vertical so as to limit the statistical probability of failure to eight lites per thousand at "Design Wind Pressures" based upon a 60 second uniform load duration.
  2. Stress Breakage: Design glass to resist temperature stress breakage.
  3. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.
  4. Glass Deflection: Limit the maximum center deflection at "Design Wind Pressures" of vertical glass, exterior or interior, to not exceed 1 in. (25 mm) and sloped glass (including skylights and glass canopies) not to exceed 1/2 in. (13mm) at center point.
  5. Minimum Glass Thickness for Exterior Lites: Not less than 1/4 in. (6 mm) for monolithic or for any lite of insulating glass units.
  6. Thickness of Tinted and Heat-Absorbing Glass: Same thickness and heat treatment for each tint color indicated throughout Project.
1. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of 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.
  2. Fire-Protection-Rated Glazing Labeling: Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, whether glazing is for use in fire doors or other openings, whether or not glazing passes hose-stream test, whether or not glazing has a temperature rise rating of 450 deg F., and the fire-resistance rating in minutes.

## **1.5 SUBMITTALS**

- A. Product Data: Submit for Architect's Action. Submit manufacturer's technical literature, specifications and installation instructions describing the general properties of each material and accessory to be used in the Work. Submit the following information from each manufacturer:
1. Complete instructions for handling, storing, mixing, priming, installing, curing and protecting each glazing material.
  2. Mirror Product Data
    - a. Submit product data for mirrors including description of materials and process used to produce mirrored glass, including source of glass, glass





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reviewed with material manufacturers' qualified technical representatives and that they agree the selected materials are proper, compatible with contiguous materials and adequate for the application shown.

- b. Certification, Tempered Glass Testing: Submit certification that tempered glass intended for use on the project has been heat soaked tested in accordance with BS EN 14179-1 "Heat Soaked Thermally Toughened Soda Lime Silicate Safety Glass".
- c. Certification, Insulating Glass Testing: Submit certification that the insulating glass units have been granted the IGCC classification "CBA" or Associated Laboratories Inc. Classification "Level A".
  - 1) Certification, Structural Silicone Sealant Compatibility: Provide certification by the structural silicone sealant manufacturer that insulating glass unit secondary seals are compatible with the proposed structural silicone sealant.
  - 2) Certification, Insulating Glass: Provide certification that insulating glass primary and secondary seals are capable of withstanding project structural loading requirements.
- d. Certification, Spandrel Glass Testing: Submit certification that spandrel glass complies with ASTM C1048 for the following tests:
  - 1) Expansion Fit Test for Ceramic Coating.
  - 2) Durability Tests of Ceramic Coating.
  - 3) Fallout Resistance.
- e. Certification, Structural Glazing Sealants: Submit certification of the following:
  - 1) That the structural silicone sealants and accessories comply with the Contract Documents and are recommended by the sealant manufacturer for the use intended.
  - 2) That the samples tested for adhesion by the sealant manufacturer comply with their requirements for structural glazing; signed by the sealant manufacturer.
- 3. Installer/Fabricator's Qualifications: Evidence of successful completion of work of similar scope to that shown and specified for this Project.
- 4. Manufacturer's Qualifications: Evidence that the specified materials have been manufactured by the same source and successfully utilized for a minimum of 5 years on projects of a similar scope to that shown and specified for this Project.
- F. Closeout Submittals: Submit, for Owner's documentation.
  - 1. Warranties: Special warranties specified in this Section.
  - 2. Maintenance Data: Furnish maintenance data for each type of glass for use

during construction and for use by the Owner after acceptance of the Work.

## **1.6 QUALITY ASSURANCE**

- A. Glazier Qualifications: Engage an experienced glazier who has completed glazing similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Insulating Glass Fabricator: Fabricator of insulating glass units shall have a minimum of 10 years experience in fabricating units similar to those specified herein on Projects comparable to this project and shall be required to comply with and assume warranty provisions specified herein.
- C. Low 'E' Coating Producer: Producer of Low 'E' type coating for glass shall have a minimum of 10 years experience in the production of Low 'E' type coating in quantities and physical characteristics similar to Low 'E' coating required for this project.
- D. Metallic Coating Producer: Producer of metallic type coatings for glass shall have a minimum of 10 years experience in the production of metallic type coatings in quantities and physical characteristics similar to metallic coating required for this project.
- E. Decorative Coating Producer: Producer of decorative type coatings for glass shall have a minimum of 10 years experience in the production of decorative type coatings in quantities and physical characteristics similar to decorative coating required for this project.
- F. Details: Glazing details are for convenience of detailing only and are to be confirmed by the Contractor and glass manufacturer relative to the cited standards and final framing details.
- G. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from such authorities.
- H. Workmanship: Comply with GANA standards, and comply with the manufacturer's instructions for the use and installation of each product. Do not use different glazing materials in the same joint system unless the manufacturer of each material has stated in writing that his material is fully compatible with the other material. Employ only tradesmen experienced in the use of the materials. The installation of each lite of glass shall be watertight and airtight, and capable of withstanding temperature changes, wind loading, and impact from operation of doors or operable sash, without failure, including loss or breakage of glass, failure of seal, exudation of sealant and excessive deterioration of glazing materials.

## **1.7 DELIVERY, STORAGE AND HANDLING**

- A. Glazing Materials: Deliver glazing materials to Project site in manufacturers' unopened containers, fully identified with trade name, color, size, hardness, type, class, and grade. Store each item in accordance with manufacturer's instructions.
- B. Delivery, Storage and Handling: Deliver, store and handle glass in accordance with manufacturer's recommendations; protected from weather, staining and damage. During storage and handling of glass provide cushions at edges to prevent impact damage. Protect glass from scratches and abrasion.

**1.8 PROJECT/SITE CONDITIONS**

- A. Field Glazing: Do not perform glazing when temperature is below 40 deg. F. (4.5 deg. C.), unless the manufacturer of the glazing materials specifically recommends application of his materials at lower temperatures. If job progress or other conditions require glazing work when temperatures are below 40 deg. F. (4.5 deg. C.) (or below the recommended minimum temperature ), consult the manufacturer and establish the minimum provisions required to ensure satisfactory work. Record in writing to the manufacturer, with copy to the Architect, the conditions under which such glazing work was performed and the provisions made to ensure satisfactory work.

**1.9 WARRANTIES**

- A. Warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and are in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.
- B. Special Warranty, Insulating Glass (Vertical Application): Provide a 10 year written warranty, addressed to the Owner and assignable to all future Owners within this warranty period, warranting glass assemblies against material obstruction of vision as a result of dust or film formation on the internal glass surfaces as a result of the failure of the hermetic seal. Upon notification of such defects, within the warrantee period make the necessary replacements at the convenience of the Owner.
- C. Special Warranty, Laminated Glass: Provide a 10 year written warranty, addressed to the Owner and assignable to all future Owners within this warranty period, warranting against deterioration of laminated glass. Deterioration of laminated glass is defined as the development of manufacturing defects including edge separation or delamination which materially obstructs vision through glass and blemishes exceeding those allowed by referenced laminated-glass standard. Upon notification of such defect, within the warranty period, make the necessary replacements at the convenience of the Owner.
- D. Special Warranty, Mirror: Provide a 5 year written warranty, addressed to the Owner and assignable to all future Owners within this warranty period, warranting against evidence of silver spoilage. Upon notification of such defects, within the warranty period, make the necessary replacements at the convenience of the Owner.

**1.10 CLOSEOUT SUBMITTALS**

- A. Deliver in manufacturer's containers, suitable for storing, clearly labeled as to type, size and thickness. Include manufacturer's instructions for care and storage of glass. Store on the premises where directed.

**PART 2 - PRODUCTS**

**2.1 GLASS**

- A. General: Provide glass in conformance with requirements of the specified standards. The acceptable range of color and/or defects as defined by the specified standards shall be determined by samples of such defects and/or color range. Glass which does not fall within the accepted sample range shall be subject to rejection by the Architect. In the event such samples are not or cannot be furnished, the Architect will determine the

acceptability of glass relative to color and/or observable defects in each case. Comply with ASTM C1036 unless otherwise specified.

- B. Float Glass: Type I, Class 1, Quality Q3.
- C. Heat Absorbing Float Glass: Type I, Class 2, Quality Q3, Style B, color as shown.
- D. Heat Treated Glass: Comply with ASTM C1048, unless otherwise specified. Type and thickness as shown or specified.
  - 1. Glass for Heat Treating
    - a. Float, Type I, Class 1, Quality Q3.
    - b. Heat Absorbing, Type I, Class 2, Quality Q3, Style B, color as shown.
  - 2. Sizes and Cutting: Prior to heat treating, cut glass to required sizes as determined by accurate measurement of openings to be glazed, making allowance for required edge clearances. Cut and process edges in accordance with glass manufacturer's recommendations. Do not cut or treat edges in the field.
  - 3. General: For glass which has been heat treated, maintain roller marks running horizontally in the final installation, with roller wave distortion parallel to the bottom edge of glass as installed, unless otherwise indicated. Roller wave distortion shall be in the same direction as quenching distortions, strain patterns or other distortions that may be a result of the heat treating process as referenced in ASTM C 1048. The Architect's judgment as to acceptability shall be final.

For glass which has been heat treated vertically, locate tong marks along an edge which will be concealed in the glazing system.

    - a. Overall Bow and Warp Tolerances: Heat treated glass shall be examined by the glass manufacturer to detect and discard lites which exceed one half (50%) the maximum bow and warp tolerances in any direction as listed in ASTM C1048 Table 2.
    - b. Roll Ripple Tolerances: Where the heat treatment process results in essentially parallel ripples or waves, the deviation from flatness at any peak (peak to valley deviation) shall not exceed 0.005 in. (0.13mm) or the average rollerwave distortion shall be certified not to exceed 0.002 in. (0.05 mm), with a maximum sag at the leading and trailing edge of 0.01 in. (0.25 mm). (The more stringent requirement governing) A site inspection if required, for roller wave and bow tolerances should be viewed from a minimum distance of 10 ft. (3 meters).
  - 4. Fully Tempered Glass: Comply with ASTM C1048, Kind FT, and meeting the requirements of ANSI Z97.1. Surface compression shall be 10,000 psi (69MPa) minimum.
  - 5. Heat-Strengthened Glass: Comply with ASTM C1048, Kind HS. Strengthen by manufacturer's standard heat-treatment process to increase the flexural strength to not less than 2 times the strength before treatment and having a surface



compression stress of 5000 psi (34.5 MPa) +/- 1500 psi (10 MPa).

- E. Spandrel Glass: ASTM C1048, Kind HS, Condition B, Type I, Class 1, Quality Q3, color as selected. Provide spandrel units identical to those passing the fallout-resistance test for spandrel glass specified in ASTM C1048. Apply fused opaque ceramic enamel coating on inside face of glass. Provide units with factory applied opacifer to second surface of spandrel glass to prevent fallout from enframement.
- F. Laminated Glass: ASTM C1172, two sheets of glass permanently factory laminated under heat and pressure with an interlayer of 0.060 in. (1.5mm) (4 layers of 0.015 in. (0.4mm) layers) thick clear, translucent, photographically patterned or colored, plasticized polyvinyl butyral made specifically for laminating glass.
  - 1. Provide type and thickness of glass sheets as shown or specified. Fabricate laminated glass to produce glass free of foreign substances and air or glass pockets in an autoclave utilizing heat plus pressure.
  - 2. Prior to laminating, cut glass to required sizes and profiles as determined by accurate measurement of openings to be glazed, making allowance for required edge clearances. Cut and process edges in accordance with glass manufacturer's recommendations. Do not cut or treat edges in the field.
- G. Low-Emissivity (Low 'E') Coated Glass: Provide low-emissivity factory applied coating complying with ASTM C1376 and resulting in a stable, uniform, nearly invisible coating which imparts average maintained insulating performance of at least  $R = 2.5$ . Comply with physical performance criteria as specified herein for each individual type of glass.
- H. Coated Glass: Provide coated glass coating complying with ASTM C1376 and as follows:
  - 1. Sputter-Coated Float Glass: Float glass with metallic-oxide or metallic-nitride coating deposited by vacuum deposition process after manufacture and heat treatment (if any), complying with requirements specified in glass type schedules.
  - 2. Pyrolytic-Coated Float Glass: Float glass with solar-reflective metallic-oxide coating applied by pyrolytic deposition process during initial manufacture, complying with requirements specified in glass type schedules.
- I. Insulating Glass Units: ASTM E2190; Use types of glass shown in fabricating insulating glass units. Use quality of glass specified hereinbefore.
  - 1. Provide dual edge-sealed insulating glass units which are certified for the insulating glass seal classification "CBA" by the Insulating Glass Certification Council (IGCC) or classification "Level A" by the Associated Laboratories, Inc. (ALI) Certification Program when tested in accordance with ASTM E2188, ASTM E2189, ASTM E773 and ASTM E774 (as sponsored by the Sealed Insulating Glass Manufacturer's Association).
    - a. Provide accurate and straight edge deletions of coatings at areas of insulating glass assemblies where Low "E" coatings, metallic coating or other decorative coatings are applied to surfaces scheduled to be in contact with the primary seal of insulating glass units.
  - 2. Fabrication: Fabricate units at factory with sheets of glass hermetically sealed at



edges with a permanent elastomeric sealant. Dehydrate entrapped air. Glass lites shall be separated by desiccant filled aluminum spacer marked with the appropriate classification, listed manufacturer and approval on the spacer with bent, welded or fused corners, splices or joints.

- J. Mirror Glass: ASTM C1503, "Mirror Select Quality"; nominal thickness 1/4 in. (6mm) thick unless otherwise shown or specified. Provide silvering, copper backing and protective heat catalyzed paint coating on entire back surface of mirror.
  - 1. Exposed edges of mirrors shall have a penciled edge profile. Perform edge treatment and sealing in factory immediately after cutting to final sizes. Do not cut or treat edges in the field.
- K. Ultra Clear Low Iron Glass: ASTM C1036, Type 1, Class 1, Quality Q3, Low iron composition soda lime glass with a minimum 91% visible light transmission and a minimum solar heat gain coefficient of 0.87. Provide one of the following:
  - 1. "Starphire" (PPG).
  - 2. "Ultrawhite" (Guardian NA).
  - 3. "Optiwhite" (Pilkington).

## **2.2 GLAZING MATERIALS**

- A. Silicone Rubber: ASTM C920, class and use as best suited for the intended purpose; Provide one of the following:
  - 1. "795 Silicone Sealant" or "790 Silicone Building Sealant"(Dow Corning Corp.).
  - 2. "SilPruf SCS2000" (Momentive Performance Materials Inc.).
  - 3. "Sikasil WS-305 Building Sealant" (Sika Corp.).
- B. Structural Silicone Rubber: Complies with ASTM C920 and ASTM C1184 requirements, is compatible with system components with which it comes in contact, and is specifically formulated and tested for use as a structural sealant; class and use as best suited for the intended purpose; Provide one of the following:
  - 1. "995 Silicone Building Sealant" (Dow Corning Corp.) for field use and "983 or 995 Silicone Building Sealant"(Dow Corning Corp.) for use in the shop.
  - 2. "Ultraglaze SSG4000 or Ultraglaze SSG4000AC Silicone Structural Glazing Sealant" (Momentive Performance Materials Inc.); for field use and "Ultraglaze SSG4600 Silicone Structural Glazing Sealant" (Momentive Performance Materials Inc.) for use in the shop.
  - 3. "Sikasil SG-18 Building Sealant" (Sika Corp.) for field use and "Sikasil SG-18 Building Sealant" or SG-500 Silicone Building Sealant"( Sika Corp.) for use in the shop.
- C. Butyl Glazing Tape Reinforced: A pre-formed, non-sagging, non-oxidizing, non-staining butyl rubber tape with core reinforcement, one of the following:

1. "Extru-Seal Butyl Rubber Tape" (Pecora Corp.).
  2. "No. 166.6 Elastic Butyl Tape" (Presstite Div.).
  3. "Tremco 440 Tape" (Tremco).
- D. Butyl Glazing Tape: A vulcanized butyl, self-adhesive, non-staining tape, one of the following:
1. "Duribbon 1082" (National Adhesives; National Starch & Chemical Corp.).
  2. "606 Architectural Sealant Tape" (Koch Protective Treatments, Inc.).
- E. Glazing Gaskets: Continuous neoprene or polyvinyl chloride extrusions, of 50 Shore A durometer hardness plus or minus 5.
- F. Glazing Gaskets
1. Closed Cell Soft Compression Gaskets: Black, continuous extruded or molded expanded foam neoprene or EPDM with a Shore A durometer hardness and profile adequate to fulfill the overall performance requirements specified, to maintain watertight seal and complying with ASTM C509, Type II. Provide adhesive on one side.
  2. Dense Compression Solid Gaskets: Black, continuous extruded or molded neoprene, EPDM or silicone with a Shore A durometer hardness and profile as required to provide pressure adequate to fulfill the overall performance requirements specified and complying with the applicable provisions of ASTM C864 or ASTM C1115.
  3. Fully vulcanize gasket corners where compatible with installation procedures.
- G. Glazing System for Structural Glazed Units
1. Glazing Spacers: Continuous preformed silicone strips, 50 +/- 5 Shore A durometer hardness, shape as shown: designed not to adhere to the structural glazing sealant. As recommended and approved by the structural sealant manufacturer and the structurally glazed curtain wall fabricator.
  2. Setting Blocks and Edge Blocks: Preformed silicone blocks, 85 +/- 5 Shore A durometer hardness, shape as shown: designed to adhere to the structural glazing sealant. As recommended and approved by the structural sealant manufacturer and the structurally glazed curtain wall fabricator.
  3. Face Shims (For Channel Glazing): As specified for edge blocks, except 50 +/-5 Shore A durometer hardness and with adhesive surface on one face. As recommended and approved by the structural sealant manufacturer and the structurally glazed curtain wall fabricator.
  4. Glazing Gaskets: In areas where glazing gaskets are required such as two sided structural glazing, provide glazing gaskets fabricated from compatible silicone rubber compounds. As recommended and approved by the structural sealant manufacturer and the structurally glazed curtain wall fabricator. Comply with manufacture's written instructions with regard to fusing mitered corners.

5. Compressible Rod: Types as shown, or as required for proper performance of the sealant in the specific joint, which is compatible with sealant, and as recommended by sealant manufacturer. Provide one of the following:
  - a. "Denver Foam" as distributed by Pecora Chemical Corp. or Woodmont Products Inc.
  - b. "Sof-Rod" (Applied Extrusion Technology).
- H. Lock-Strip Gaskets: ASTM C542, neoprene extrusions. Frames fabricated with injection molded corners. Provide with separate lock (zipper) strips, Shore A durometer: 10 points harder than gasket body.
- I. Setting Blocks: ASTM C864; neoprene blocks, 80 to 90 Shore A durometer hardness.
- J. Edge Blocks: ASTM C864; neoprene blocks, 60 to 70 Shore A durometer hardness.
- K. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.
- L. Joint Cleaner, Primer and Sealer: The products recommended by the manufacturer. Never apply or allow primers to come into contact with glass surfaces.
- M. Mirror Components
  1. Mirror Mastic: An adhesive setting compound, manufactured specifically for setting mirrors by spot application, certified as compatible with back of mirror coating by organic protective coating manufacturer, scheduled mirror substrate and approved by mirror manufacturer. Comply with mirror mastic manufacturer's written instructions for size, number and pattern of mastic spots required for installation. Subject to compliance with requirements, provide products by one of the following:
    - a. "Ultra/bond Mirror Mastic" (Gunther Mirror Mastics, C.R. Laurence Co., Inc.)
    - b. "Mirro-Mastic" (Palmer Products Corporation).
    - c. "Ultra/bond Mirror Mastic" (Royal Adhesives & Sealants).
  2. Mirror Edge Sealer: A mirror edge sealer manufactured specifically for sealing mirror edges and that has proven to be compatible with mirror coating and approved by mirrored glass manufacturer for use in protecting against silver deterioration at mirror edges; Provide one of the following:
    - a. "CRL Seal-Kwik" (C.R. Laurence Co., Inc.).
    - b. "No. 209 Mirror Edge Sealant" (Sprayway, Inc.).
  3. Stainless Steel Angle Mirror Support and Frame: AISI Type 304; hot or cold rolled angle; 1 in. (25mm) x 1 in. (25mm) x 1/8 in. (2mm) thick; polish edge of

exposed portion of angle to bright finish.

## **2.3 FABRICATION**

- A. Sizes: Fabricate glass to sizes required for glazing openings indicated, with edge clearances and tolerances complying with recommendations of glass manufacturer. Provide thicknesses indicated or, if not otherwise indicated, as recommended by glass manufacturer for application indicated.
- B. Cutting: Obtain sizes from shop drawings or by field measurement. Cut glass to fit each opening with edge clearances and bite on glass as recommended by glass manufacturer. Do not nip glass edges. Factory cut heavy heat absorbing glass (3/8 in. (9mm) and above) and heavy float glass (1/2 in. (13mm) and above). Edges may be wheel cut or sawed and seamed at manufacturer's option. For glass to be cut at site, provide glass larger than required so as to obtain, clean-cut edges without seaming or nipping. Do not cut, seam, nip or abrade glass after heat-tempering.
- C. Edgework for Butt Glazing: Where glass is to be butt joined with silicone sealant, provide flat ground butting glass edges having a satin finished flat edge with eased arrise corners.
- D. Edgework for Exposed Edges: Where edges of glass are to be exposed in the finish work, provide ground and polished edges and slightly eased arrises and eased corners.
- E. Insulating-Glass Units: Preamsembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E2190 and ASTM E774 for "Class CBA" (IGCC) or "Level A" (ALI) units. Dimensions indicated in the Glass Schedule are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge. Fill sealed space with dry air or other dry gas with a dew point not exceeding -50 deg. F. (-26 deg. C.) Exclude dirt and other foreign substances. Dual seal, with polyisobutylene primary seal and silicone secondary seal unless otherwise shown or specified. Provide manufacturer's standard spacer material with molecular sieve or silica gel desiccant, or blend of both., and construction
  - 1. Space-Bar Frame: Tubular aluminum with hot dip soldered, sealed corners and filled with desiccant, with breather ports into the sealed space; sized to provide sealed space of thickness shown. Provide spaces complying with the following requirements:
    - a. Aluminum with bronze color-anodized finish.
  - 2. Structural Glazed Insulating Units: Factory glaze structural silicone work. Clean the frames and glazing material surfaces with suitable solvent. Prime surfaces and install sealant according to the sealant manufacturer's recommendations. Clean excess sealant before the sealant cures. Do not transport units until sealant has cured.
    - a. Provide insulating glass units with a silicone secondary seal in accordance with ASTM C1369 and complying with IGCC-certified "CBA" level or Associated Laboratories Inc. Classification "Level A" and compatible with specified structural silicone sealant glazing system.
    - b. Dual Edge-Seal: Primary sealant of polyisobutylene. Secondary sealant of 2 component silicone; specifically produced for secondary seals of

insulating glass units and approved for use in structural silicone glazing systems.

## **2.4 GLASS SCHEDULE**

- A. Glass Type GL-01 Monolithic Glazing: Ultra Low iron, 1/2" Tempered
- B. Glass Type GL-02 Laminated Glass: 1/2" Infill assembly in SF-01 system with PVB interlayer, to match GL-03
- C. Glass Type GL-03 Insulated Glass Unit – Viracon VE1-48

### **Physical Properties**

#### **Transmittance**

Visible Light:	47%
Solar Energy:	30%
Ultra Violet:	<19%

#### **Reflectance**

Visible Light Exterior:	17%
Visible Light Interior:	11%
Solar Energy:	22%

#### **ASHRAE U-Value**

Winter Nighttime:	0.31 BTU/(hr x ft <sup>2</sup> x F°)
Summer Daytime:	0.29 BTU/(hr x ft <sup>2</sup> x F°)

Shading Coefficient:	0.43
Solar Factor (SHGC):	0.37

Relative Heat Gain:	90.43 BTU/(hr x ft <sup>2</sup> x F°)
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- D. Glass Type GL-04 Mirror Glass: 1/4" thick adhered to backer

## **PART 3 - EXECUTION**

### **3.1 GENERAL**

- A. Manufacturer's Instructions: Prepare substrates, apply primers and install the work of this Section, including components, and accessories in accordance with the manufacturer's instructions, except where more stringent requirements are shown or specified, and where project conditions require extra precautions or provisions to ensure satisfactory performance of the Work.

### **3.2 EXAMINATION**

- A. Verification of Conditions: Examine the areas to receive the Work and the conditions under which the Work would be performed. Contractor shall remedy conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

### **3.3 PREPARATION**

- A. Substrate Acceptability: Commencement of installation shall constitute acceptance of substrate conditions by the Installer.
- B. Cleaning: Clean glazing channels, stops and rabbets to receive glazing materials of obstructions and deleterious substances which might impair the work. Remove protective coatings which might interfere with bond of sealants.
- C. Priming: Prime surfaces to receive glazing compounds, except where manufacturer provides written reports of tests conducted by an independent testing agency which demonstrates that primer or sealer is not required for the conditions of use and the substrates involved. When priming, comply with manufacturer's recommendations both for materials and procedures.
- D. Inspection: Inspect each piece of glass immediately before installation. Do not install pieces which are improperly sized or have damaged edges, scratches or abrasion or other evidence of damage. Remove labels from glass immediately after installation.

### **3.4 INSTALLATION**

- A. Standards: Unless otherwise shown or specified, comply with recommendations and requirements of the GANA "Glazing Sealing Systems Manual" and "Glazing Manual".
- B. Setting Blocks: Locate setting blocks at sill one-quarter of the width in from each end of the glass, unless otherwise recommended. Use blocks of sized 1/8 in. (3mm) wider than the glass thickness and 1/16 in. (1.5mm) to 1/8 in. (3mm) less than the width of the glazing channel to support the glass.
- C. Face Shims: Provide face shims for glass sizes larger than 50 united in. (1.3m), to separate glass from stops, except where continuous glazing gaskets or felts are provided. Locate face shims opposite each other and no farther than 24 in. (600mm) apart and no closer than 12 in. (300mm) to a corner. Make bite of spacer on glass a nominal 1/4 in. (6mm) or greater.
- D. Edge Blocks: Provide edge blocks, located in glazing rebate to insure against displacement of the glass and against metal to glass contact within the rebate and to ensure permanently adequate bite of the glass within the glazing system.
- E. Setting of Glass: Set glass in a manner which produces greatest possible degree of uniformity in appearance. Where safety glazing is scheduled or required, install glass after detaching removable safety glazing label unless otherwise required by authorities having jurisdiction. If local authorities require permanent labeling, install glass with permanent safety glazing label in concealed or inconspicuous locations subject to selection by the Architect.
- F. Glazing Materials: Do not use 2 different glazing materials in the same joint system unless the manufacturer of each material has stated in writing that his material is fully compatible with the other material.
  - 1. Use suitable protection to limit coverage of glazing materials to the surfaces intended for sealants.
  - 2. Miter-cut and seal joints of glazing gaskets to provide a continuous watertight and airtight seal at corners and other locations where joints are required.

Vulcanize corner joints where compatible with installation procedure. Where wedge-shaped gaskets are driven into one side of channel to pressurize gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

3. Tool exposed surfaces of glazing materials to provide a slight wash away from the glass. Install exposed tapes and gaskets with a slight protrusion above stops in the final compressed condition.

- G. Insulating Glass Units: Set insulating glass units with void between edge of units and glazing channel. Do not glaze insulating glass units with glazing compounds which might have a deleterious effect on the seal of the units. Completely conceal the edge binding of insulating glass units with glazing material and extend material a minimum of 1/8 in. (3 mm) onto glass surfaces at each edge, to provide glazing seal independent of hermetic seal.

1. Set insulating glass units which have one sheet of heat absorbing, tinted or coated glass with clear glass sheet faced to the interior.

- H. Structural Sealant Glazed Units

1. Provide face shims for glass structurally glazed to separate glass from stops. Locate face shims opposite each other and no farther than 24 in. (600mm) apart and no closer than 12 in. (300mm) to a corner. Make bite of space: on glass a nominal 1/4 in. (6mm) or greater.
2. Provide continuous glazing spacers, sized and located to allow for sealant dimensions which will meet the specified Performance criteria.
3. Where joint filler is used as backup for sealants, install filler continuously to depth and shape for proper application and performance of products. Apply joint fillers accurately to form the joint profile shown. Provide watertight and airtight corners and joints.
4. Install bond breaker in joints as shown and wherever required to prevent bond of the sealant to surfaces where such bond might impair the Work.
5. Apply sealants in continuous beads without open joints, voids or air pockets so as to provide a watertight and airtight seal for the entire joint length. Seal joints on the exterior of the building, both curtain wall-to-curtain wall joints and curtain wall-to-contiguous construction. Tool exposed surfaces of glazing sealants to provide a slight wash away from the glass.

- I. Lock Strip Gaskets: Comply with ASTM C716. Miter-cut corners of loose lock-strips. Cut lock-strips slightly longer to provide permanent compression at joints. Use special tool to install and remove filler strips; lubricate in accordance with manufacturer's instructions.

- J. Mirror Glazing

1. Adhesive Mounting of Mirrors
  - a. Identify and examine surfaces over which mirror is to be mounted. Comply with printed installation directions for preparation of mounting



surfaces including coating surfaces with special bond coating where applicable or priming and sealing substrate as recommended.

- b. Paint back of mirror with an additional coat of moisture-resistant paint of the type compatible with mirror mastic and substrate. Apply mirror edge sealer to edges of mirror.
  - c. Provide 1/2 in. (13mm) thick fire-retardant treated plywood mirror backerboards as specified in Section 06 10 00 "Rough Carpentry". Provide 1 in. (50mm) x 1 in. (50mm) x 1/8 in. (3mm) thick stainless steel angle frame with mitered corners and bright polished finished exposed edges. Secure angle frame to wall construction with fastening devices appropriate for substrates encountered spaced 16 in. (400mm) o.c. maximum. Secure plywood backerboard to wall using fastening devices appropriate for substrates encountered spaced 12 in. (300mm) o.c. maximum at perimeter 1/2 in. (13mm) from corners and three rows of 3 fasteners each in the backerboard field. Countersink fasteners flush with plywood surface. Butt adjacent panels without lapping. Prepare panels for priming as required by manufacturer of mirror mastic.
  - d. Support mirror with stainless steel satin finished angle frame with bottom support designed to withstand mirror weight. Provide 1/8 in. (3mm) thick by 4 in. (100mm) long x 1/4 in (6mm) wide setting blocks at quarter points. Apply mirror mastic utilizing special tool to assure complete and accurate coverage. Do not cover more than 25% of mirror back . Provide neoprene shims, double face tape or other type compatible material to allow for minimum clearances for mastic. Apply mirror to substrate so that areas not covered with mastic will remain open for ventilation, with minimum clearance from substrate as recommended. Provide temporary rigid support until adhesive has set.
  - e. Fill 1/8 in. (3mm) wide joint between stainless steel angle and face of mirror with continuous backer rod and clear silicone sanitary rubber sealant.
- K. Glass To Glass Glazing: Apply silicone rubber sealant to abutting surfaces of glass.
- L. Completed Installation: The installation of each lite of exterior glass shall be watertight, airtight, and capable of withstanding temperature changes, wind loading and impact from operation (doors and operable sash) without failure of any kind including loss or breakage of glass, failure of seal, exudation of sealant and excessive deterioration of glazing materials.
- M. Entrance Glass/Visual Distraction Marks: Paint window and door distraction markings on glass surfaces, in colors, uniform patterns and spacings shown and as required to comply with the requirements specified in Paragraph "References". Provide one of the following methods:
- 1. Field paint glass utilizing glass preparation methods and paints to provide uniform characters with sharp edges and tightly registered patterns, free from blemishes or other defects which, in the Architect's opinion, will impair the finished work.



2. Provide markings (specifically manufactured for application to glass) applied to the glass to provide uniform characters with sharp edges and tightly registered patterns, free from blemishes or other defects which, in the Architect's opinion, will impair the finished work.

### **3.5 CLEANING**

- A. General: Maintain glass in a reasonably clean condition during construction so that it will not become stained and will not contribute to the deterioration of glazing materials. Conduct a systematic inspection program not less than once a month for glass. Clean to meet above requirements. Clean excess sealant or compound from glass and framing members immediately after application. Wash glass on both faces not more than 4 days prior to acceptance by the Owner.

### **3.6 PROTECTION**

- A. General: Protect glass from breakage immediately upon installation. Use streamers or ribbons suitably attached to framing and held free of the glass. Do not apply warning markings directly to the glass. Do not permit edges of glass to be exposed to standing water. Protect glass and glazing materials during the construction period so that they will be without indication of damage or deterioration at the time of acceptance by the Owner. Cover glass to protect it from activities that might abrade the surfaces.
- B. Replacement: Replace glass during the construction period which is broken, cracked, chipped or damaged in any way and from any source, including weather, vandalism or accidents.

**END OF SECTION**

**SECTION 09 21 14  
PLASTER SYSTEMS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. General: Provide plaster systems in accordance with requirements of the Contract Documents for repair patching and new installations as required.
- B. Related Work Specified Elsewhere:
  - 1. Section 01 81 13 "Sustainable Design Requirements" for additional references, definitions, documentation requirements, action plans, meetings, and performance requirements of products and systems.
  - 2. Firestopping is specified in Section 07 84 00 "Firestopping".
  - 3. Sealants and joint fillers other than specified herein installed at interface of lath and plaster assemblies and other building components are specified under Section 07 92 00 "Joint Sealants".
  - 4. Access doors are furnished under Section 08 31 00 "Access Doors and Panels" and installed under this section.
  - 5. Interior Acoustical Plaster per 09 27 17 "Gypsum Board Assemblies".
  - 6. Finish painting of lath and plaster assemblies is specified in Section 09 91 00 "Painting".
  - 7. Plaster rings for electrical and mechanical devices and lighting fixtures are furnished under various Division 21, 22, 23, and Division 26 specification sections and installed under this section.

**1.2 REFERENCES**

- A. General: Comply with the applicable provisions of the referenced standards except as modified by governing codes and the Contract Documents. Where a recommendation or suggestion occurs in the referenced standards, such recommendation or suggestion shall be considered mandatory. In the event of conflict between referenced standards, this specification or within themselves, the more stringent standard or requirement shall govern.
- B. ASTM International (ASTM)
  - 1. ASTM C841 "Standard Specification for the Installation of Interior Lathing and Furring".
  - 2. ASTM C1063 "Standard Specification for the Installation of Lathing and Furring for Portland Cement-Based Plaster".
  - 3. ASTM C842 "Standard Specification for the Application of Interior Gypsum Plaster".



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- 4. ASTM C926 "Standard Specification for the Application of Portland Cement Based Plaster".
- C. Metal Lath/Steel Framing Association: ML/SFA "Specifications for Metal Lathing and Furring".
- D. Portland Cement Association: PCA "Portland Cement Plaster (Stucco) Manual".

### 1.3 DEFINITIONS

- A. Plaster: The term "plaster" on the Drawings means gypsum plaster base coats and lime putty trowel finish unless otherwise noted. Apply 3-coat work on all bases.
- B. "Stucco" or "Cement Plaster: The terms "stucco" or "cement plaster" on the Drawings means Portland cement based plaster with a float finish unless otherwise noted. Apply 3-coat work on all bases.

### 1.4 SYSTEM DESCRIPTIONS

- A. Performance Requirements
  - 1. Loading Criteria, Exterior Soffit: The installed exterior cement plaster or stucco soffit systems shall withstand an upward and downward wind pressure of \_\_\_ psf normal to the plane of the soffit without displacement, structural failure, cracking, crazing, permanent distortion or other damage. Permanent distortion or displacement is defined as values exceeding 50% of specified installation tolerances.
  - 2. Temperature Criteria: Design, fabricate and install component parts scheduled for installation on the exterior, to provide for expansion and contraction over an ambient temperature range of 120 deg. F. (49 deg. C.) and a surface temperature range of 180 deg. F. (82 deg. C.) without buckling, sealed joint failure, undue stress on members or anchors, and other detrimental effects.
  - 3. Movements: Design, fabricate and install plaster system Work to withstand building movements due to loading deflections, shrinkage and creep whose values are shown or specified elsewhere.
- B. Requirements Of Regulatory Agencies: Wherever a fire resistance classification is shown involving plaster systems (3-hr., 2-hr. and similar designations), provide materials, accessories and application procedures which have been listed by UL or tested according to ASTM E119 to achieve the rating required.
- C. Design Modifications: Make design modifications only as may be necessary to meet performance requirements and coordinate the Work. Variations in details and materials which do not adversely affect appearance, durability or strength shall be submitted to the Architect for review.

### 1.5 SUBMITTALS

- A. Product Data: Submit, for Architect's action. Submit manufacturer's technical literature and specifications describing the general properties of each type of lath, mesh, channel,



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hanger, stud, joist, clip, bracket, bead, stop, expansion joint, control joint, screed and special shape required, including other data as may be required to show compliance with the Contract Documents.

- B. Shop Drawings: Submit for Architect's action. Submit shop drawings for the fabrication and installation of the Work. Prepare detailed shop drawings, at full scale of unusual conditions involving plaster system Work, including structural studs and framing, expansion and control joints (including locations), details of attachment to primary ceiling supports, special hangers, special runners, metal trim and details at light fixtures and ceiling diffusers. Show locations of access panels occurring in plaster Work and details of rated assemblies, with copies of their respective approvals. Coordinate components which are specified elsewhere, which are a part of, or are contiguous, with the system.
- C. Samples: Submit for Architect's action. Label samples to indicate product, characteristics, and location in the Work. Samples will be reviewed for color and appearance only. Furnish sufficient samples to establish the full range of colors and textures for materials exposed in the finished work. Compliance with other requirements is the responsibility of the Contractor. Submit the following:
  - 1. Sample panels for preliminary review of each texture and finish not less than 2 ft. sq. (1.8 sq. m), on movable frames. Include typical control joint and expansion joint. Sample panels shall be representative of materials, finishes, textures and workmanship for the entire Work. Acceptance will be for finish and texture only.
  - 2. Samples of the following:
    - a. Expansion joint and control joint: 12 in. (300mm) long.
    - b. Each type plaster accessory: 12 in. (300mm) long.
- D. Quality Control Submittals: Submit for Architect's information. Submit the following:
  - 1. Certificates:
    - a. Document Review: Before commencing work, submit a written statement signed by the Contractor and the Applicator certifying that the Contract Documents, shop drawings and product data have been reviewed with material manufacturers' qualified technical representatives and that they agree the selected materials are proper, compatible with contiguous materials and adequate for the application shown.
    - b. Producer's certification for each type of aggregate and cement specified, evidencing compliance with requirements.
  - 2. Installer's Qualifications: Evidence of successful completion of work of similar scope to that shown and specified for this Project.
  - 3. Manufacturer's Qualifications: Evidence that the specified materials have been manufactured by the same source and successfully utilized for a minimum of 5 years on projects of a similar scope to that shown and specified for this Project.

**1.6 QUALITY ASSURANCE**

- A. Single-Source Responsibility: Obtain plaster ingredients, furring and lathing and other plaster and lath components from one source of a single manufacturer. Obtain accessory products used in conjunction with plaster system Work from the plaster system manufacturer or from sources acceptable to the plaster system manufacturer.
- B. Qualified Installer: The machine applied plaster work shall be performed by an installer having five (5) years experience in the machine application of plaster on projects similar in size and scope to this Project.
- C. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from such authorities.
- D. Field Samples: Prior to the Pre-Installation Meeting, provide a field sample for each type of plaster system construction and special conditions in the building at areas to be designated by the Architect. Utilize the same materials and installation methods in the sample as required for the final Work. Schedule the installation with allowance for sufficient curing time so that the sample may be examined, and any necessary adjustments made, at least 1 week prior to date scheduled for commencing installation of the Work. When accepted, sample areas shall serve as the standard for materials, workmanship, and appearance for such Work throughout the project and shall remain a part of the final Work.
- E. Pre-Installation Meeting: Prior to the start of the Work, meet at the Project site to review material selections, methods and sequence of installation, special details and conditions, standard of workmanship, quality control requirements, job organization, coordination with other trades, and other pertinent topics related to the Work.

**1.7 DELIVERY, STORAGE AND HANDLING**

- A. Packing, Shipping, Handling and Unloading: Deliver in manufacturer's unopened containers or bundles, fully identified with name, brand, type and grade. Handle and protect plaster system materials from damage. Store in a dry, ventilated space, off the ground.
- B. Storage and Protection: Neatly stack gypsum lath flat to prevent deformation. Handle gypsum lath to prevent damage to edges, ends, or surfaces. Protect metal cornerbeads and trim from being bent or damaged. Protect materials from contamination, dampness, aging, corrosion, and damage from construction traffic and other causes until used. Protect lime putty from sun exposure, and prevent excessive evaporation when stored.

**1.8 PROJECT/SITE CONDITIONS**

- A. General: Comply with the requirements of Paragraph "References" and recommendations of the component manufacturers for project/site conditions before, during and after performing the Work and as follows:
  - 1. Interior Plaster: Do not start plaster system Work until the building is enclosed and interior spaces are ventilated and continuously maintained at a uniform temperature not less than 40 deg. F. (4.5 deg. C.) nor more than 80 deg. F. (27 deg. C.) for not less than one week prior to application. Continuously maintain

temperature one week after the plaster Work is complete. Provide ventilation to remove the water in excess of that required for hydration of the plaster, immediately subsequent to its application and set.

2. Exterior Stucco and Portland Cement Plaster: Do not start exterior lath, Portland cement plaster and stucco Work until the ambient temperature is above 40 deg. F. (4.5 deg. C.) without provisions for temporary heating and enclosures. Protect Work from uneven and excessive evaporation.

## **1.9 WARRANTY**

- A. General: Warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and are in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. General: Provide materials as made or recommended by a single manufacturer for the plaster systems, including metal framing and trim accessories, used throughout the Work. Plaster systems produced by one of the following manufacturers will be acceptable, subject to review by Architect.
  1. La Habra
  2. U. S. Gypsum Co.
  3. Gold Bond Building Products Div./National Gypsum Co.
  4. Georgia-Pacific Corp.

### **2.2 METAL MATERIALS**

- A. Where framing is damaged or insufficient to support new work provide metal framing as noted below.
- B. System Components: Manufacturers' standard steel studs of type, size, shape, and gauge as indicated or if not indicated as required to comply with performance criteria specified. With each type of metal framing required, provide manufacturer's standard, steel runners (tracks), blocking, lintels, clip angles, shoes, reinforcements, fasteners, and accessories for applications indicated, as needed to provide a complete metal framing system.
- C. Non-Load Bearing Studs and Runners: ASTM C645 roll formed steel, hot-dip galvanized in accordance with ASTM A653 Designation G60; type and size as shown. Minimum 25 ga. unless heavier gauge is shown or recommended by the manufacturer for the wall system indicated.
- D. Load Bearing (Transverse and Axial) Steel Studs, Joists, Runners, Bracing and/or Bridging: ASTM C955; hot dipped galvanized steel sheet complying with ASTM A1003 Structural Grade 33 Type H for 20 ga. (1.0mm) and below (33,000 psi (230 MPa) yield

point) , Structural Grade 37 Type H for 18 ga. (1.3mm) to 20 ga. (1.0mm) (37,000 psi (255 MPa) yield point) and Structural Grade 50 Type H for 16 ga. (1.6mm) and greater (50,000 psi (340 MPa) yield point), Coating Designation G90 (Z275 275 g/m<sup>2</sup>).

- E. Clip Angles, Flat Straps, Web Stiffeners, Hole Reinforcement Plates, Web Stiffeners, and Other Type Clips: ASTM C955; hot dipped galvanized steel sheet complying with ASTM A1003 Structural Grade 33 Type H for 20 ga. (1.0mm) and below (33,000 psi (230 MPa) yield point) , Structural Grade 37 Type H for 18 ga. (1.3mm) to 20 ga. (1.0mm) (37,000 psi (255 MPa) yield point) and Structural Grade 50 Type H for 16 ga. (1.6mm) and greater (50,000 psi (340 MPa) yield point), Coating Designation G90 (Z275 275 g/m<sup>2</sup>).
- F. Furring and Runner Channels: Either hot-rolled or cold-rolled steel, of the sizes shown or required by Local Building Code or, if none are shown, of the following minimum weights per thousand lineal ft. (300m):

Size, in. (mm)	Hot-Rolled, lb. (kg)	Cold-Rolled, lb (kg)
3/4 in. (19mm)	300 (135 kg)	300 (135 kg)
1 in. (25mm)	410 (185 kg)	---
1-1/2 in. (38mm)	1120 (508 kg)	475 (215 kg)
2 in. (50mm)	1260 (570 kg)	590 (268 kg)

- G. Hat Furring Channels: ASTM C645, roll-formed galvanized steel, flanged channel type, 7/8 in. (22mm) deep; for wall furring and ceiling attachment.
- H. Primary Suspension Members for Ceilings
1. Wire Hanger Inserts: No. 6 galvanized wire loop and 26 ga. (0.55mm) galvanized shell or 14 ga. (2mm) galvanized steel strap with 5/16 in. (8mm) dia. hole.
  2. Strap Iron Hanger Inserts: Mild steel flats, 1 in. (25mm) x 3/16 in. (5mm) with 7/16 in. (11mm) dia. holes punched on center line and lower ends, designed to develop the full strength of hangers.
  3. Strap Iron Hanger Inserts: Mild steel flats, 1 in. (25mm) x 3/16 in. (5mm) x 3 in. (75mm) with 7/16 in. (11mm) dia. holes punched on center line and both ends, designed to develop the full strength of hangers and bent at 90 deg. to permit anchor bolt attachment to existing slab.
  4. Hanger Anchorage Devices: Screws, clips, bolts or other devices applicable to the indicated method of structural anchorage for ceiling hangers. Provide anchorage devices sized for three (3) times the calculated load supported.
  5. Hangers: Galvanized, one of the following:
    - a. 3/16 in. (5mm) x 1 in. (25mm) steel straps.
    - b. 1/4 in. (6mm) diameter steel rods.
  6. Carrying Channels: ASTM C754, cold rolled steel channels, 1-1/2 in. (38mm), 414 lbs. (188kg) per 1000 linear ft (300m).

7. Clips: Provide support clips, clamps, fasteners, and other attachment devices as required to connect components and transfer imposed loads of primary suspension system.
- I. Pencil Rods: Hot-rolled of circular cross-section 1/4 in. (6mm) or 3/8 in. (9mm) diameter as required for the respective conditions of use.

## **2.3 ACCESSORIES**

- A. General: Accessories shall have perforated or expanded flanges or clips shaped so as to permit complete embedment in the plaster, to provide means for accurate alignment and secure attachment to the substrate. Coordinate depth of accessory with thickness of plaster.
  1. Interior Use: Provide accessories complying with ASTM C841 and fabricated from zinc coated (galvanized) steel for interior use. Comply with ASTM C841, Paragraph 6.6 for thickness of accessories for interior use.
  2. Exterior Use: Provide accessories fabricated from white metal zinc alloy (99% zinc, 0.75% chromium, and not more than 0.25% impurities) for exterior use. Comply with ASTM C1063, Table 3 for thickness of accessories for exterior use.
- B. Corner Beads: Formed with a bead not exceeding 3/16 in. (5mm) with expanded metal flanges at least 2-1/2 in. (63mm) wide; ground thickness appropriate to installation.
- C. Casing and Stop Beads: Formed with 3 in. (75mm) min. expanded metal wing; ground thickness appropriate to installation.
- D. Expansion and Control Joint: Double "V" type, formed with expanded metal flanges at least 1-1/4 in. (31mm) wide; ground thickness appropriate to installation.
- E. Special Stops: Formed as detailed. Tack weld a continuous 20 ga. (1mm) sheet metal closure on backside of stop where plaster abuts other surfaces. At expansion joints, where shown, tack weld a continuous 20 ga. (1mm) backplate to one casing bead, leaving opposite bead free to slide on backplate; ground thickness appropriate to installation.
- F. Corner Reinforcement: Smooth edge strips of expanded metal lath; Cornerite, 6 in. (150mm) wide, bent to form 3 in. (75mm) wings for internal plaster angles.
- G. Striplath: Smooth edge flat strips of expanded metal lath not less than 4 in. (100mm) wide for reinforcing joints.
- H. Screeds and Weep Screeds: Formed with expanded metal wings not less than 2 in. (50mm) wide.
- I. Sheet Metal Grounds: ASTM A653/A653M Structural Quality steel with hot-dip galvanized G60 0.60 oz./ft.<sup>2</sup> (Z180 180 g/m<sup>2</sup>) zinc coating. Minimum 20 ga. (1.0 mm) thick and sized as required for fastening to studs for supporting wall-mounted fixtures, equipment or required for attachment of other work.
- J. Special Metal Trim: Such as ceiling trim, bases, and sub-bases. Fabricate from ASTM





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A1008, stretcher leveled steel sheet; 18 gauge (1.2mm), unless otherwise shown.  
Provide baked enamel shop applied finish in colors as selected by Architect.

### 2.4 FASTENINGS

- A. Tie Wire: ASTM A641, Class 1, soft tempered galvanized steel wire, not less than 16 ga. (1.5mm) for tying furring channels to runner channels or other supports and not less than 18 ga. for tying lathing to furring channels.
- B. Furring Brackets for attachment to masonry or concrete: 20 ga. (1mm) galvanized steel with serrated edges, adjustable from 1/4 in. (6mm) to 2 1/4 in. (56mm).
- C. Attachment Clips: Galvanized sheet metal devices complying with Paragraph "References" and as recommended by lath manufacturer specially designed for attachment of lath to framing members and lath to lath.
- D. Steel Screws: Corrosion resistant, self-drilling and self-tapping; ASTM C1002, Type G, Type S, or Type W screws suitable for fastening into steel not greater than 20 ga. (1mm) and ASTM C954 for fastening into steel of 20 ga. (1mm) to 14 ga. (2mm) thickness.
- E. Lathing Nails: Hardened, zinc-coated masonry nails, barbed roofing nails, offset-head or hook-head lath nails; lengths as required for proper anchorage.

### 2.5 LATHING MATERIALS

- A. Expanded Metal Lath: ASTM C847, expanded metal lath fabricated from galvanized steel sheet. Spray paint end bundles in different colors to denote various weight and types.
- B. Diamond Mesh: Flat expanded metal lath weighing not less than 3.4 lbs. per sq. yd. (1.8kg per m<sup>2</sup>).
- C. Self-Furring Diamond Mesh: Flat expanded metal lath with indentations to hold lath 1/4 in. (6mm) from wall surface or from face of steel, weighing not less than 3.4 lbs. per sq. yd. (1.8kg per m<sup>2</sup>).

### 2.6 PLASTER MATERIALS AND MIXES

- A. Cement Plaster and Stucco
  - 1. Aggregates: ASTM C897; natural sand, except use graded silica sand passing a 30 mesh screen.
  - 2. Hydrated Lime: ASTM C206, Type S.
  - 3. Portland Cement: ASTM C150 Type I, II or Type III as required.
  - 4. Bonding Agent (for Portland Cement Plaster and Portland Cement Stucco): ASTM C932; One of the following:
    - a. "Weldcrete" (Larsen Products Corp.)
    - b. "Daraweld-C" (Grace Construction Products.)



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### **2.7 MISCELLANEOUS MATERIALS**

- A. Water: Potable and free from deleterious materials which would impair the Work.
- B. Neoprene Tape: ASTM D1056, Grade SCE41 soft sponge neoprene with adhesive one side, black; 1/4 in. (6mm) x 1/2 in. (13mm), unless otherwise shown.

### **2.8 METAL FABRICATION**

- A. Galvanizing: Galvanize exterior hangers, furring channels and metal lath. Form exterior accessories of white metal (zinc alloy).
  - 1. Metal lath and lathing accessories which are specified to be galvanized, shall be galvanized after fabrication. Galvanize inserts, hangers and channels by the hot-dip process in accordance with ASTM A123.
- B. Items not galvanized shall be given 1 coat of rust-inhibitive primer after fabrication.
- C. Weights listed or shown are weights of the material before it is galvanized or painted.

### **2.9 MIXES**

- A. Proportions: Mixes are by volume unless otherwise specified.
- B. Cement Plaster (Stucco) Basecoats and Finish Coats: ASTM C926. Mix proportions may be varied to meet local conditions and achieve the desired finish within the limits specified in cited standards and subject to acceptance by the Architect.

### **2.10 PLASTER TYPES**

- A. Plaster Type PLA-1: 3-Coat Portland Cement Plaster, 1" overall thickness
- B. Plaster Type PLA-2: Interior Acoustical Plaster – See 09 21 17 "Gypsum Board Systems"

## **PART 3 - EXECUTION**

### **3.1 GENERAL**

- A. Manufacturer's Instructions: Prepare substrates and apply the work of this Section, including components and accessories in accordance with the manufacturer's instructions, except where more stringent requirements are shown or specified, and where project conditions require extra precautions or provisions to ensure satisfactory performance of the Work.

### **3.2 EXAMINATION**

- A. Verification of Conditions: Examine the areas to receive the Work and the conditions under which the Work would be performed. Remedy conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected.

### **3.3 PREPARATION**

- A. Substrate Acceptability: Commencement of installation shall constitute acceptance of substrate conditions by the Installer.
- B. Dimension Verification: Verify dimensions of supporting structure by field measurements so that the Work will be accurately designed, fabricated and fitted to the structure. Tolerances for supporting structure are specified in other Sections.
- C. Coordination: Coordinate Work with the work of other Sections and provide items to be placed during the installation of other work at the proper time to avoid delays. Place such items, including inserts and anchors, accurately in relation to the final location of components. Coordinate access hatches, plaster rings and other items occurring in lathed surfaces and specified in other Sections with the work of this Section.

### **3.4 PLASTER SUBSTRATE INSTALLATION, GENERAL**

- A. Tolerances: Erect components in accordance with the manufacturer's written instructions and recommendations and referenced standards. Provide the following construction tolerances:
  - 1. Variation from plumb or level in any exposed line or surface: +/- 1/8 in. (3mm) in 10 ft. (1m).
  - 2. Variation between planes of abutting edges or ends: +/- 1/16 in. (1.5mm).
- B. Isolation of Work: Where lathing and metal support system abuts building structure, isolate the Work from structural movement sufficiently to prevent transfer of loading into the Work from the building structure. Install slip type joints to absorb deflections but maintain lateral support. Provide slip gaskets to ensure freedom of movement. Do not over tighten fasteners; where movement is required, strike threads to prevent backing off of nuts. Frame both sides of control and expansion joints independently, and do not bridge joints with furring and lathing or other accessories.
- C. Supplementary Framing, Blocking And Bracing: Provide supplementary framing, blocking and bracing at terminations in the Work and for support of fixtures, equipment, heavy trim and similar work.
- D. Design Temperature: Dimensions shown on Drawings are based on an assumed design temperature of 70 deg. F. (21 deg. C.) Fabrication and erection procedures shall take into account the ambient temperature at the time of the respective operations.
- E. Cut and Abraded Surface Treatment: Paint cut and abraded surfaces of rust-inhibitive treated and galvanized metal materials with a coat of an approved rust-inhibitive primer at the project site, before use.

### **3.5 STEEL STUD INSTALLATION**

- A. General: Install components for steel stud partition support system to comply with the written instructions and recommendations of the steel stud manufacturer and applications indicated and with the following reference standards:
  - 1. For installation of steel studs, furring and accessories for gypsum plaster

application, use roll formed type steel studs and comply with ASTM C841.

2. For installation of steel studs, furring and accessories for cement plaster and/or stucco application, use roll formed type steel studs and comply with ASTM C1063.
  3. For installation of steel studs and related accessories (including erection tolerances) for load-bearing (axial and transverse) system application comply with ASTM C1007.
- B. Stud Spacing:** Space metal studs a maximum of 16 in. (400mm) o.c. unless otherwise shown, noted or required by referenced standard. Align runner tracks accurately to the partition layout at both floor and ceiling. Secure runner channels to the floor with anchors 24 in. (600mm) o.c., unless otherwise shown. When construction above is concrete, fasten ceiling track same as floor track. Where partition extends to a suspended ceiling, wire-tie stud track to runner channels or furring channels, unless otherwise shown.
1. Place a stud 2 in. (50mm) from abutting partitions, internal corners, partition terminals, studs inserted into metal frames and other similar locations. Install two studs on each side of metal door frames, accurately centered, and attached to the anchor clips securely with double strand 18 ga. (1.2mm) tie wire.
- C. Runner Tracks:** Provide runner tracks continuously at the head and sill of framed openings in partitions. Provide stud shoes, wire clips and anchorage assemblies recommended by the manufacturer of steel studs for a complete stud installation. Coordinate work with ceiling work. Stiffen partitions over 10 ft. (1m) high with 1-1/2 in. (38mm) channel stiffeners, permanently wired on the inside of the partition running continuously, not to exceed 6 ft. (1.8m) o.c. spacing. Where door frames do not extend to ceiling, place one: 3/4 in. (19mm) channel brace no more than 6 in. (150mm) above frame, extended at least two full stud spaces behind each side of the frame and securely wire tied or welded to the flange of each stud.
- D. Load Bearing Steel Studs:** Provide load bearing steel joists in the metal stud framed walls as necessary to frame the openings indicated. Secure joists to studs using pre-manufactured steel brackets or joist hangers of sufficient size and strength or utilize custom engineered connections as required to sustain the imposed loads.

### **3.6 FURRING INSTALLATION**

- A. General:** Provide metal furring where shown and as specified and complying with referenced standards, to provide a suitable base for plastering. Include steel shapes, clips, wire and other attachments necessary to bring finished surface to lines shown. Secure furring to supporting construction with furring brackets. Install furring devices as required to provide clearance for forming plaster keys. Stagger end laps.

### **3.7 SUSPENDED SOFFITS SUPPORTS INSTALLATION**

- A. General:** Provide ceiling support components complying with referenced standards and manufacturer's written instructions and recommendations.
- B. Hangers and Inserts:** Provide hangers and inserts necessary to support suspended ceilings below concrete slab before concrete is cast and in time to avoid delay in work.

Give particular attention to the correct location and alignment of hangers and inserts. Provide hangers of ample length. Secure hangers without inserts to steel reinforcement or embed hangers in the concrete so as to develop full strength. Inserts shall develop full the strength of hangers attached to them. Locate hangers not less than 6 in. (150mm) from each end and spaced 4 ft. (1.2m) maximum along each runner channel. Coordinate placement of hangers, runner channels, and furring channels with the location of electrical fixtures, ceiling diffusers, grilles, access panels, sprinkler heads, and other items occurring in or on the ceiling. Provide a trapeze framework or splay hangers only where required to miss obstructions and offset horizontal force by bracing or other approved methods.

- C. Supplemental Framing: Where ceilings are suspended below ductwork, piping or other building elements which are not suitable for ceiling attachment due to strength limitations, or restrictions of authorities having jurisdiction, provide additional supplemental framing, supports and related work as required to span beneath these elements from suitable support locations.
- D. Rigid Installation: Provide brass wedges and other materials as required to make metal lathing and furring installation rigid. Frame openings in lathed surfaces with furring strips so that recessed items finish flush, unless otherwise shown.
- E. Hangers for Exterior Soffits: Where two piece hangers are used at exterior soffits, provide two fasteners to join upper and lower hangers pieces to preclude "hinging" under uplift pressures.
- F. Vibration Hangers: Acceptable spring type hangers consisting of steel box containing a coiled spring in series with neoprene cap. Furnish hangers with provisions for fastening to each side with appropriate furring system. Finish with rust inhibitive paint.

### **3.8 LATHING**

- A. General: Install lath in accordance with the following referenced standards:
  - 1. For installation of interior lathing, furring and accessories for gypsum plaster application, comply with ASTM C841.
  - 2. For installation of gypsum lath and accessories for gypsum plaster application, use punched type or nailable type of steel studs and comply with ASTM C841.
  - 3. For installation of metal lath, furring and accessories for cement plaster and/or stucco application comply with ASTM C1063.
- B. Strip Lath: Install continuous strip lath at junction of dissimilar surfaces to be plastered. At corners of openings exceeding 2 sq. ft. (0.18m<sup>2</sup>) in area, install strips of metal lath 12 in. (300mm) wide x 24 in. (600mm) long at a 45 deg. angle. Attach stucco mesh to solid surfaces with nails spaced 6 in. (150mm) apart.
- C. Framing of Control and Expansion Joints: Frame both sides of control and expansion joints independently and do not bridge joints with furring, lathing or accessories. Shim metal lath away from metal studs to provide for proper bonding of the plaster to the lath.

### **3.9 ACCESSORY INSTALLATION**

- A. Corner Beads: Provide corner beads on external corners and in single lengths where the length of a corner or jamb does not exceed the manufacturer's standard lengths. Miter or cope at corners, and fasten securely with tie wire, or lathing nails spaced not more than 8 in. (200mm) staggered. Provide corner reinforcement at internal corners. Provide strip lath at changes in plaster base material.
- B. Casing Beads: Provide casing beads where shown and where plastering terminates and is not covered by other finish. Provide sheet metal closures at reveals. Set the beads level, plumb and true to line. Align joints with concealed splice or tie plates. Where the structural backing is concrete or masonry, secure the beads with hardened galvanized nails or drive screws driven into fiber plugs set in masonry or by other approved methods. Space fastenings not more than 8 in. (200mm) apart.
- C. Expansion and Control Joints: Install expansion and control joints as required for replacement at existing locations.

### **3.10 PREPARATION FOR APPLICATION OF PLASTER**

- A. Protection Prior to Installation: Protect fixtures, frames, access panels, inserts and other contiguous work from rusting, soiling, clogging or any type damage due to plastering operations.
- B. Preparation and Conditioning
  - 1. For surface preparation and conditioning of surfaces for application of gypsum plaster, comply with ASTM C842.
  - 2. For surface preparation and conditioning of surfaces for application of cement plaster and stucco, comply with ASTM C926 and recommendations of the PCA.
  - 3. Prepare monolithic surfaces for bonded base coats for application of gypsum plaster, cement plaster and stucco in compliance with the referenced standards.

### **3.11 PLASTER APPLICATION, GENERAL**

- A. Preparation
  - 1. Where casing beads or plaster stops do not occur at juncture of plaster and hollow metal frames or other built in metal items, finish with a vee groove. Where a finish coat is not required, as behind built-in cabinets, furnishings and fixed equipment, finish brown coat to a true, even surface, with angles plumb and square.
  - 2. Prior to lathing, grout hollow metal frames, bases and similar work occurring in plastered areas, with base coat material. Except where full grouting is indicated or required for fire resistance ratings, grout 6 in. (150mm) lengths at each anchorage.
- B. Mixing
  - 1. General: Use mechanical mixers for mixing plaster except where hand mixing of

small batches is acceptable. Do not use frozen, caked, or lumped material. Clean mechanical mixers, mixing boxes and tools after mixing each batch; keep free of plaster from previous mixes. Thoroughly mix plaster with proper amount of water until uniform in color and consistency. Retempering not permitted; discard plaster which has begun to stiffen. Provide waterproof protection under mixer.

2. Machine Applied Plaster: Determine proper consistency by slump test as follows: Take slump test samples from nozzle of plastering machine hose using a 2 in. (50mm) x 4 in. (100mm) x 6 in. (150mm) slump cone. Samples will be taken at random as often as may be required and without prior notice.
  - a. Gypsum Plaster: Maximum 3 in. (75mm) slump.
  - b. Portland Cement Plaster or Stucco: Maximum 2-1/2 in. (63mm) slump.
- C. Method of Application: By hand or machine application. Limit machine application to basecoats, except where machine texture finish is specified.
- D. Thickness of Plaster
  1. Portland Cement Plaster and Portland Cement Stucco: Total thickness 1 in. (25mm) minimum; Comply with ASTM C926 Table 4 for applications not otherwise shown or specified.
- E. Application of Portland Cement Plaster and Stucco Plaster
  1. Apply Portland cement plaster scratch, brown, and finish coats to comply with ASTM C926 with the following type finish coat:
    - a. Finish to match existing
- F. Application of Bonding Agent: Apply bonding agent in accordance with manufacturer's written instructions and recommendations and the referenced standards.

### **3.12 FIELD QUALITY CONTROL**

- A. Contractor's Quality Control Responsibilities: Contractor is solely responsible for quality control of the Work.
- B. Plaster Sampling: If directed, remove portions of plaster Work for examination of quality. Samples may be taken from work in place at any time. Areas represented by samples which show oversanding or wrong aggregate proportion will be rejected.

### **3.13 ADJUSTING**

- A. Removal of Defective Work: Work containing cracks, blisters, pits, checks, or discoloration will not be accepted. Remove such work, including rejected work, and replace with new. Patching of defective work permitted only when approved.
- B. Cutting, Patching, Repairing And Pointing-Up: Perform cutting, patching, repairing and pointing-up operations neatly and thoroughly. Repair the cracks and indented surfaces by



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moistening the plaster and filling with new material, troweled or tamped flush with adjoining surfaces. Point-up and finish surfaces around fixtures, outlet boxes, piping, fittings, tile and other work flush with adjacent plaster. Where new plaster adjoins plaster which has been installed more than 48 hours, cut existing plaster at an angle of approximately 45 deg. with the surface before installing new plaster.

### **3.14 CLEANING**

- A. Cleaning: Make provisions to minimize the spattering of plaster on other work. Promptly clean windows and other surfaces which have been soiled by the Work of this Section.

### **3.15 PROTECTION**

- A. Protection: Protect plaster from the weather, freezing, premature drying, marking, dirt, dust, marring or other damage throughout the construction period so that it will be without indication of damage at the time of acceptance by the Owner.

**END OF SECTION**



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**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. General: Provide gypsum board systems in accordance with requirements of the Contract Documents.
- B. Interior Acoustical Plaster: Furnish all labor, materials, equipment and services necessary to the completion of all field applied acoustical plaster panel system. Extent of work is indicated on drawings.
- C. Related Work Specified Elsewhere:
  - 1. Section 01 81 13 "Sustainable Design Requirements" for additional references, definitions, documentation requirements, action plans, meetings, and performance requirements of products and systems.
  - 2. Cold-formed metal framing is specified in Section 05 40 00 "Cold-Formed Metal Framing".
  - 3. Firestopping is specified in Section 07 84 00 "Firestopping".
  - 4. Sealants and joint fillers other than specified herein installed at interface of gypsum board assemblies and other building components are specified under Section 07 92 00 "Joint Sealants".
  - 5. Access doors are furnished under Section 08 31 00 "Access Doors and Panels" and installed under this section.
  - 6. Finish painting of gypsum wallboard assemblies is specified in Section 09 91 00 "Painting".

**1.2 REFERENCES**

- A. General: Comply with the applicable provisions of the referenced standards except as modified by governing codes and the Contract Documents. Where a recommendation or suggestion occurs in the referenced standards, such recommendation or suggestion shall be considered mandatory. In the event of a conflict between referenced standards, this specification or within themselves, the more stringent standard or requirement shall govern.
- B. American National Standards Institute (ANSI): ANSI A118.9, "Specification for Cementitious Backer Units".
- C. ASTM International (ASTM):
  - 1. ASTM A123, "Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products".
  - 2. ASTM A641, "Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire".



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3. ASTM B221, "Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes".
4. ASTM C11 "Standard Terminology Relating to Gypsum and Related Building Materials and Systems".
5. ASTM C475, "Specification for Joint Compound and Joint Tape for Finishing Gypsum Board".
6. ASTM C645, "Standard Specification for Nonstructural Steel Framing Members".
7. ASTM C665, "Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing".
8. ASTM C754, "Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products".
9. ASTM C834, "Standard Specification for Latex Sealants".
10. ASTM C840, "Specification for Application and Finishing of Gypsum Board".
11. ASTM C919, "Use of Sealants in Acoustical Applications".
12. ASTM C954, "Specification for Steel Drill Screws for the Application of Gypsum Panel Products".
13. ASTM C1002, "Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products".
14. ASTM C1047, "Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base".
15. ASTM C1063, "Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster".
16. ASTM C1177, "Specification for Glass Mat Gypsum Substrate for Use as Sheathing".
17. ASTM C1396, "Specification for Gypsum Board".
18. ASTM D4397, "Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications".
19. ASTM E84, "Standard Test Method for Surface Burning Characteristics of Building Materials".
20. ASTM E90, "Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements".
21. ASTM E119, "Standard Test Methods for Fire Tests of Building Construction and Materials".

22. ASTM E336, "Standard Test Method for Measurement of Airborne Sound Attenuation between Rooms in Buildings".
23. ASTM E413, "Classification for Rating Sound Insulation".
- D. Gypsum Association (GA):
  1. GA-214, "Recommended Levels of Gypsum Board Finish".
  2. GA-216, "Application and Finishing of Gypsum Panel Products".
  3. GA-226, "Application of Gypsum Board to Form Curved Surfaces".
  4. GA-253, "Application of Gypsum Sheathing".
  5. GA-600, "Fire Resistance Design Manual".

### **1.3 SYSTEM DESCRIPTION**

- A. Performance Requirements
  1. Movements: Gypsum board systems are designed to withstand building movements due to loading deflections, shrinkage and creep whose values are shown or specified elsewhere.
    1. Interior gypsum board walls are designed to withstand a lateral loading of 5 psf (240 Pa) positive and negative pressure, and maximum deflection not to exceed 1/240 of the wall height. If more stringent requirements are required, notify Architect.
  2. Sound Characteristics for Assemblies: For systems with STC ratings, provide materials and construction identical to those of assemblies whose STC ratings were determined according to ASTM E90 and classified according to ASTM E413 by a qualified independent testing agency.
  3. Fire-Resistance-Rated Assemblies: Wherever a fire resistance classification is shown involving gypsum board systems (3-hr., 2-hr. and similar designations), provide materials, accessories and application procedures which have been listed by UL or tested according to ASTM E119 to achieve the rating required.
- B. Design Modifications: Make design modifications only as may be necessary to meet performance requirements and coordinate the Work. Only modifications that do not adversely affect appearance, durability or strength will be considered. Submit to the Architect for review.

### **1.4 SUBMITTALS**

- A. Product Data: Submit, for Architect's action, manufacturer's technical data for each component of gypsum board systems, including related accessories.
- B. Samples: Submit for Architect's action. Label samples to indicate product, characteristics, and location in the Work. Samples will be reviewed for color and appearance only. Furnish sufficient samples to establish the full range of colors and textures for materials exposed in the finished work. Compliance with other requirements is the responsibility of



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the Contractor.

1. 12 in. (300mm) long sample of each type of trim accessory.
2. 12 in. x 12 in. samples of acoustic plaster on specified substrate showing texture and color

**C. Quality Control Submittals: Submit for Architect's information.**

1. Certificates
  - a. Document Review: Before commencing work, submit a written statement signed by the Contractor and the subcontractor certifying that the Contract Documents, shop drawings and product data have been reviewed with material manufacturers' qualified technical representatives and that they agree the selected materials are proper, compatible with contiguous materials and adequate for the application shown.
  - b. Certification signed by manufacturer of gypsum board systems certifying that their products comply with specified requirements, comply with UL designations shown and are approved for use by local authorities having jurisdiction.
  - c. Interior Acoustical Plaster manufacturer's written certification that product is 100% free of asbestos, polystyrene and cellulose
2. Installer's Qualifications: Evidence of successful completion of work of similar scope to that shown and specified for this Project.
  - a. Submit certification of applicator licensing for interior acoustical plaster.
3. Manufacturer's Qualifications: Evidence that the specified materials have been manufactured by the same source and successfully utilized for a minimum of 5 years on projects of a similar scope to that shown and specified for this Project.
4. Submit Independent Laboratory test data for specified finish and effect of painting.

**1.5 QUALITY ASSURANCE**

- A. Single-Source Responsibility**
1. Single-Source Responsibility for Metal Framing: Obtain metal framing members for gypsum board systems from a single manufacturer acceptable to the gypsum board system manufacturer.
  2. Single-Source Responsibility for Panel Products: Obtain each type of gypsum board and other panel products from a single manufacturer.
  3. Single-Source Responsibility for Finishing Materials: Obtain finishing materials from either the same manufacturer that supplies panel materials or from a manufacturer acceptable to panel manufacturer.

- B. Qualified Installer: The gypsum board systems work shall be performed by an installer having 5 years experience in the installation of similar materials to those specified on projects comparable to this Project.
- C. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from such authorities.
- D. Interior Acoustical Plaster:
  - 1. A. Provide acoustical panels manufactured from recycled crushed glass and coated with plaster finish which has been tested to and achieved the following values:
  - 2. Provide testing results and procedures from an independent and accredited acoustical testing laboratory. Edges of test samples must be sealed with wooden or metal frames.
  - 3. Installer: licensed or approved by manufacturer or distributor.
  - 4. Mock Up: Provide mock up inclusive of contiguous work in location indicated in drawings.

## **1.6 DELIVERY, STORAGE AND HANDLING**

- A. Package, Shipping, Handling and Unloading: Deliver materials to project site in manufacturer's unopened containers with brand, type and grade clearly indicated. Handle materials to prevent damage to edges, ends, and surfaces.
- B. Storage and Protection: Store materials inside, above grade in a dry, ventilated space, under cover and in accordance with manufacturer's instructions.

## **1.7 PROJECT/SITE CONDITIONS**

- A. Temperature Limitations: Do not install gypsum board joint treatments when the outside temperature is below 55°F (15.5C°), unless building is enclosed and heated to maintain a continuous and uniform temperature of not less than 55°F. (15.5C°), from one week prior to beginning of joint treatment until joint treatment is completed and thoroughly dry. Temperature requirements may be waived only upon recommendation by gypsum board materials manufacturer and with approval of Architect. Ventilation, either natural or supplied by fans, circulators or air conditioning systems shall be provided to remove excess moisture during joint treatment.

## **1.8 WARRANTY**

- A. General: Warranties and guaranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and are in addition to and run concurrent with other warranties and guaranties made by the Contractor under requirements of the Contract Documents.
- B. Special Warranty for interior acoustical plaster: Manufacturer shall warrant the material to be supplied, agreeing to repair/replace that which has cracked, flaked, dusted excessively, peeled or fallen from substrate, or otherwise deteriorated to a condition where it would not perform effectively as intended for a sound absorbent purpose; due to



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defective materials and not due to abuse, improper maintenance, unforeseeable ambient exposures, or other causes beyond anticipated conditions by manufacturer. The warranty period will be 5 years from date of substantial completion.

- C. Special Warranty, Exterior Sheathing: Submit for Owner's documentation. Furnish a written warranty, for a 5 year period, in a form stipulated by the Architect, signed by the Contractor, manufacturer, and installer, against manufacturing defects. Upon notification of such defects, within the warranty period, make the necessary repairs and replacements, at the convenience of the Owner. Other guarantees or warranties may not be substituted by the Contractor for the terms of this special warranty.

**PART 2 - PRODUCTS**

**2.1 PANEL MATERIALS**

- A. Gypsum Board, Regular: ASTM C1396. Special tapered/round edge design. Provide one of the following:
1. "Sheetrock, SW Edge" (USG).
  2. "ToughRock Gypsum Board" (Georgia-Pacific Gypsum).
  3. "Regular Drywall" (Continental Building Products).
  4. "ProRoc Regular/ProRoc EVENWALL" (CertainTeed Gypsum).
- B. Gypsum Board, Type "X": ASTM C1396. "Type X", with tapered edges. Where fire ratings are indicated, use thickness required to comply with testing. Provide one of the following:
1. "ToughRock Fireguard X Gypsum Board" (Georgia-Pacific Gypsum).
  2. "Gold Bond Fire-Shield" (National Gypsum Company).
  3. "Sheetrock Firecode" (USG).
  4. "Firecheck Type X" (Continental Building Products).
  5. "ProRoc Type X/EVENWALL Type X" (CertainTeed Gypsum).
- C. Gypsum Shaft Liner Board: ASTM C1396, 1 in. (25mm) thick, unless otherwise shown. Gypsum shaft liner board specially manufactured for shaft wall construction with moisture-resistant faces, rated "Type X" when tested in accordance with ASTM E119. Provide one of the following:
1. "DensGlass Shaftliner" (Georgia-Pacific Gypsum).
  2. "Gold Bond Fire-Shield Shaftliner XP" (National Gypsum Company).
  3. "Sheetrock Brand Enhanced Gypsum Liner Panels" (USG).
  4. "Shaftliner Type X Drywall" (Continental Building Products).



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5. "ProRoc Shaftliner Type X" (CertainTeed Gypsum).
- E. Moisture Resistant Gypsum Board: ASTM C1396, 5/8 in. (16mm) thick unless otherwise shown or specified. "Type X", with tapered edges. Provide one of the following:
1. "DensShield Tile Backer" (Georgia-Pacific Gypsum).
  2. "Gold Bond XP Gypsum Board" (National Gypsum Company).
  3. "Sheetrock Mold Tough Gypsum Panels" (USG).
  4. "Watercheck" (Continental Building Products).
  5. "ProRoc Moisture Resistant" (CertainTeed Gypsum).
- F. Abuse Resistant Gypsum Board: ASTM C1396, 5/8 in. (16mm) thick unless otherwise shown or specified, specifically manufactured to resist abuse; "Type X"; provide one of the following:
1. "ToughRock Abuse-Resistant Gypsum Board" (Georgia-Pacific Gypsum).
  2. "Hi-Abuse Brand XP Wallboard" (National Gypsum Company).
  3. "Sheetrock Brand Abuse-Resistant Gypsum Panels" (USG).
- F. Impact-Resistant Gypsum Board: ASTM C1396, and ASTM C1629 with Hard Body Impact Resistance of Level [2][3], 5/8 in. (16mm) thick unless otherwise shown or specified, specifically manufactured to resist abuse; "Type X"; provide one of the following:
1. "DensArmor Plus Impact-Resistant Interior Panel" (Georgia-Pacific Gypsum).
  2. "Gold Bond EXP Interior Extreme IR Gypsum Panel" (National Gypsum Company).
  3. "Sheetrock Brand Mold Tough VHI Firecode Core" (USG).
- D. Cementitious Backer Board: Provide cementitious backer units complying with ANSI A118.9, ASTM C1288 or ASTM C1325; 1/2 in. (13mm) thick and in maximum lengths available to minimize end-to-end butt joints; Provide one of the following:
1. "Durock Cement Board" (U.S. Gypsum Co.).
  2. "PermaBase" (National Gypsum Co.).
  3. "Wonder-Board" (Custom Building Products).
  4. "Util-A-Crete Concrete Backer Board" (FinPan, Inc.).
- H. Soffit Board: ASTM C1396, especially intended for indirect weather exposure; 5/8 in. (16mm) thick unless otherwise shown or specified, "Type X", with manufacturer's standard tapered edges.

1. "Gold Bond Exterior Soffit Board" (National Gypsum Company).
  2. "Sheetrock Exterior Gypsum Ceiling Board" (USG).
  3. "Firecheck Soffitboard Type X" (Continental Building Products).
  4. "Exterior Soffit Board" (CertainTeed Gypsum).
- I. Exterior Sheathing: Meet or exceed the physical property requirements of ASTM C1177. 5/8 in. (16mm) thick unless otherwise shown or specified; provide one of the following:
1. "DensGlass Sheathing" (Georgia-Pacific Gypsum).
  2. "Gold Bond eXP Extended Exposure Sheathing" (National Gypsum Company)
  3. "Fiberock Aqua-Tough Sheathing/Securock Glass-Mat Sheathing" (USG).
  4. "Weather Defense Platinum Sheathing" (Continental Building Products).
  5. "GlasRoc Sheathing" (CertainTeed Corp).
- J. Acoustical Plaster Backerboard: A. Recycled crushed glass board fastened to rigid ceiling framing.

## **2.2 ACOUSTICAL PLASTER:**

- A. StarSilent Panel System as supplied by Pyrok Inc.,
1. 914-777-7070, 914-277-5135 or approved equal.
- B. Finish shall be smooth finish.
- C. Color shall be white. Do not paint.

## **2.3 METAL FRAMING AND FURRING**

- A. Channel Studs and Runners/Tracks: ASTM C645 steel components with ASTM A653 hot-dip galvanized G40 (Z120) zinc coating, roll-formed channel shapes, with stud flanges not less than 1-1/4 in. (32 mm) wide. Sizes as indicated. Provide one of the following:
1. "ProStud Drywall Framing System" (ClarkDietrich Building Systems).
  2. "ViperStud Drywall Framing System" (Marino\Ware).
  3. "Supreme Framing System" (Scafco Corporation).
- B. Bridging and Bracing Channels: ASTM C955, cold-rolled steel, hot-dip galvanized. 1-1/2 in. (38 mm) channels, weighing 0.414 lb/ft. (0.616 kg/m), or equivalent shape. Provide prepunched clip angles of same material for securing channels to stud framing.
- C. Framing for Shaft Walls: Structural quality steel components with ASTM A653 hot-dip galvanized G40 (Z120) zinc coating. Provide C-H studs, E studs, I studs, J runners, jamb





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struts, and other members as required for complete installation. Sizes as indicated. Provide one of the following:

1. "Shaftwall System" (ClarkDietrich Building Systems).
  2. "CT Shaftwall System" (Marino\Ware).
  3. "Shaftwall" (Scafco Corporation).
- D. Furring Channels: ASTM C645, roll-formed galvanized steel, flanged channel type; for wall furring and ceiling attachment. Provide one of the following:
1. "Hat/Furring Channel" (ClarkDietrich Building Systems).
  2. "Furring Channel" (Marino\Ware).
  3. "Hat Channel" (Scafco Corporation).
- E. Furring Brackets: "FCWB Adjustable Wall Furring Bracket" Adjustable, serrated-arm type, fabricated from galvanized steel sheet complying with ASTM C645, minimum thickness of base (uncoated) steel of 0.033 in. (0.8mm), designed for screw attachment to metal studs and steel rigid furring channels used for furring.
- F. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs. Provide the following or approved equal:
1. "MaxTrak" (ClarkDietrich Building Systems).
- G. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs. Provide one of the following or approved equal:
1. "Fire Trak System" (Fire Trak Corp.).
  2. "FlameSafe FlowTrak System" (Grace Construction Products).
  3. "The System" (Metal-Lite, Inc.)
- H. Resilient Channel: ASTM C645 steel components with ASTM A924 hot-dip galvanized G40 (Z120) zinc coating. Provide one of the following:
1. "RC Deluxe Resilient Channel" (ClarkDietrich Building Systems).
  2. "Resilient Channel RC-1" (Marino\Ware).
  3. "RC-1 Resilient Sound Channel" (Scafco Corporation).
- I. Zee Furring Channels: ASTM C645 steel components with ASTM A924 hot-dip galvanized G40 (Z120) zinc coating. Provide one of the following:
1. "Z-Furring Channels" (ClarkDietrich Building Systems).

2. "Z-Furring Channel" (MarinoWare).
  3. "Supreme Z-Furring" (Scafco Corporation).
- J. Backing Plates: Structural quality steel with ASTM A653 hot-dipped galvanized G60 (Z180) zinc coating. Minimum 18 ga. (1.2mm) thick and sized as indicated on Drawings or as required for fastening to studs for supporting wall-mounted fixtures, equipment or required for attachment of other work.
- K. Corner Angles: Formed galvanized steel sheet angles. Provide the following:
1. "CA-Series Corner Angle" (ClarkDietrich Building Systems).
- L. Ties: ASTM C1063 and ASTM A641, 18 gauge (1.2mm) tie wire. Comply with the requirements of Underwriters' Laboratories, Inc., and the gypsum board manufacturer. "TW18 Tie Wire".
- M. Primary Suspension Members for Ceilings:
1. Wire Hanger Inserts: No. 6 galvanized wire loop and 26 gauge (0.55mm) galvanized shell or 14 gauge (2mm) galvanized steel strap with 5/16 in. (8mm) hole.
  2. Strap Iron Hanger Inserts: Galvanized mild steel flats, 1 in. (25mm) x 3/16 in. (5mm) with 7/16 in. (11mm) holes punched on center line and lower ends, designed to develop the full strength of hangers.
  3. Hanger Anchorage Devices: Screws, clips, bolts or other devices applicable to the indicated method of structural anchorage for ceiling hangers. Provide anchorage devices sized for five (5) times the calculated load supported.
  4. Hangers: ASTM A641, soft temper galvanized steel wire, one of the following:
    - a. 3/16 in. (5mm) x 1 in. (25mm) steel straps.
    - b. 1/4 in. (6mm) diameter steel rods.
    - c. 9 gauge (3.9mm) soft steel wire.
  5. Carrying Channels: ASTM C754, cold rolled galvanized steel channels, 1-1/2 in. (38mm), 414 lbs. (188kg) per 1000 linear ft (300 linear m).
  6. Clips: Provide support clips, clamps, fasteners, and other attachment devices as required to connect components and transfer imposed loads of primary suspension system.
- N. Suspension Members for Support of Exterior Soffits: Galvanized (ASTM A123) round steel pencil rods, flat iron or soft steel straps, sized as required to comply with the performance requirements specified, and ASTM C754 for the maximum soffit areas to be supported. Provide hot dip galvanized carrying channels, support clips, clamps, fasteners, and other attachment devices required to connect components and transfer imposed loads of primary exterior soffit suspension system.



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### 2.3 FASTENERS

- A. Metal Framing to Structure: Powder driven fasteners providing not less than 200 lbs. (890 N) pull-out strength and 700 lbs. (3115 N) ultimate shear strength.
- B. Metal Drill Screws for Gypsum Board Systems: ASTM C1002, Type G, Type S, or Type W screws, and suitable for fastening into steel not greater than 20 ga. (1.0 mm) thickness. ASTM C954, for fastening into steel of 20 ga. (1.0 mm) to 12 ga. (2.8 mm) thickness. Pan head for metal to metal connections. Bugle head for fastening gypsum board.
- C. Fasteners for Cement Board: Corrosion-resistant, coated, metal drill screws of size and type recommended by board manufacturer.
- D. Fasteners for Exterior Applications: Galvanized steel or stainless steel.
- E. Stub Nails: 9 ga. (3.75 mm) case-hardened and quenched steel nails for fastening to concrete.
- F. Other Applications: For other applications involving gypsum board, comply with gypsum board manufacturer's printed recommendations.

### 2.4 TRIM ACCESSORIES

- A. General: For fire rated assemblies, provide materials, including accessories and fasteners produced by one manufacturer, or, when products of more than one manufacturer are used in a rated system, the combination shall be acceptable to authorities having jurisdiction.
- B. Corner Beads: ASTM C1047. Galvanized steel, smooth rigid nose and perforated-knurled flanges suitable for joint treatment. Install in one piece when manufactured in length required. Provide one of the following:
  - 1. "103 Delux" (ClarkDietrich Building Systems).
  - 2. "1-1/4 Corner Bead" (MarinoWare).
  - 3. "Dur-A-Bead Corner Bead" (USG).
- C. Casing Beads: ASTM C1047. Provide for protection of exposed gypsum board edges around openings. Galvanized steel, J-shape trim with beaded nose and perforated-knurled flange suitable for joint treatment. Sized for 1/2 in. (13mm) or 5/8 in. (19mm) gypsum board; install in one piece when manufactured in length required.
  - 1. "Metal U-Trim #200" (ClarkDietrich Building Systems).
  - 2. "U Trim" (MarinoWare).
  - 3. "Sheetrock 200-A Metal Trim" (USG).
- D. Control Joint Trim: ASTM C1047. One-piece joint assembly of roll-formed zinc or extruded vinyl with perforated flange suitable for joint treatment. Provide one of the following:



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1. "No. 093" (ClarkDietrich Building Systems).
  2. "Zinc Control Joint" (Marino\Ware).
  3. "Sheetrock Zinc Control Joint No. 093" (USG).
- E. Aluminum Trim: ASTM B221; extruded or formed aluminum trim with 1/4 in. (6mm) dia. holes in fins for attachment to gypsum board, staggered 1/2 in. (13mm) on center; longest lengths available; in sizes indicated on Drawings; primed for finish painting; provide one of the following for each type specified:
1. Jamb Reveal
    - a. "STR Series" (Pittcon Industries).
    - b. "DRMZ Series" (Fry Reglet Architectural Metals).
    - c. "Series 300" (Gordon Inc.).
  2. Channel Wall Reveal
    - a. "SWR Series" (Pittcon Industries).
    - b. "DRM Series" (Fry Reglet Architectural Metals).
    - c. "Series 500" (Gordon Inc.).
  3. Partition End Caps: Extruded aluminum end cap with chemical conversion coating, sizes as noted; provide one of the following:
    - a. "Drywall Molding End Closure" (Fry Reglet Corp.).
    - b. "Drywall End Closure" (Flannery, Inc.).

**2.5 AUXILIARY MATERIALS**

- A. Joint Treatment Materials: ASTM C475.
1. Joint Tape for Panel Materials: Polymer-coated, glass-fiber mesh.
  2. Joint Compound for Panel Materials: Material recommended by panel manufacturer.
  3. Tape for Vapor Retarder: Material recommended by vapor retarder manufacturer.
- B. Acoustical Sealant: Nonsag, paintable, nonstaining, latex sealant complying with ASTM C834 [with a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24)]. Sealant shall effectively reduce airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90. Provide one of the following:
1. "AC-20 FTR" (Pecora Corporation).

2. "Acoustical Sealant" (Tremco Mfg. Co.).
  3. "Smoke and Sound" (Specified Technologies, Inc.).
  4. "Quiet Seal ProAC-20 + Silicone" (Serious Energy, Inc.).
- C. "SAFB", Sound Attenuation Fire Blankets: Provide at fire rated partitions, in accordance with the Partition Schedule indicated on the drawings. ASTM C665, Type I Unfaced blanket insulation with water-resistant binders produced by combining mineral fibers of slag wool or rock wool with thermosetting resins. Thermal conductivity of "k" = 0.25 Btu in./hr. ft.<sup>2</sup> °F. (0.036 W/m °C.) at 75°F. (24°C.). Minimum 3 pcf (48 kg/m<sup>3</sup>) density. ASTM E84, flame spread 15, smoke developed 10, or less. Provide manufacturer's standard sizes in thickness indicated. Provide one of the following:
1. "Sound Attenuation Fire Blankets" (CertainTeed Corporation).
  2. "Delta SA Fire Board (Sound Attenuation)" (RockWool Manufacturing Company, Inc.).
  3. "Acoustical Fire Batt" (Roxul Inc.).
  4. "Sound Attenuation Fire Blankets" (Thermafiber LLC).
- E. "SAB", Sound Attenuation Blankets: Provide at non-rated partitions, in accordance with the Partition Schedule indicated on the drawings. ASTM C665, Type I unfaced blanket insulation with water-resistant binders produced by combining fiberglass with thermosetting resins. Provide one of the following:
1. "Sound Control Batts" (Johns Manville). Includes at least 20% post-consumer and 5% pre-consumer recycled content. Contains no formaldehyde. Classified as 25/50 in accordance with ASTM E84.
  2. "QuietZone Sound Attenuation Batt Insulation" (Owens Corning). Includes at least 9% post-consumer and 26% pre-consumer recycled content. Classified as 25/50 in accordance with ASTM E84.
- F. Fire Safing, Fire Sealant, and Cementitious Seals: Refer to Section 07 84 00 "Firestopping".
- G. Electrical Outlet Pads:
1. Non Fire Rated
    - a. "Lowry's Outlet Box Pads" (Lowry's Inc.).
    - b. "Sound Pad #68" (L.H. Dottie Co.).
  2. Fire Rated
    - a. "Flamesafe FSP 1077 Putty Pads" (Grace Construction Products).
    - b. "Putty Pads" (Specified Technologies Inc.).
    - c. "Hilti CP617 Putty Pads" (Hilti).



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- J. Vapor Retarder: 4 mil. (100  $\mu$ m) polyethylene film. ASTM D4397, with permeance rating of 0.13 perm (7.5 ng/Pa x s x sq. m).
- K. Water: Clean and free of deleterious material.

### PART 3 - EXECUTION

#### 3.1 GENERAL

- A. Manufacturer's Instructions: Prepare substrates and install the work of this Section, including components, and accessories in accordance with the manufacturer's instructions, except where more stringent requirements are shown or specified, and where project conditions require extra precautions or provisions to ensure satisfactory performance of the Work.

#### 3.2 EXAMINATION

- A. Verification of Conditions: Examine the areas to receive the Work and the conditions under which the Work would be performed. Contractor shall remedy conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected.

#### 3.3 PREPARATION

- A. Substrate Acceptability: Commencement of installation shall constitute acceptance of substrate conditions by the Installer.

#### 3.4 INSTALLATION, GENERAL

- A. Framing
  - 1. General: Install metal stud components in accordance with ASTM C754.
  - 2. Isolation from Structure: Isolate framing from building structure to prevent transfer of loading imposed by structural movement both horizontally and vertically, at the following locations:
    - a. Where edges of suspended ceilings abut building structure horizontally at ceiling perimeters or penetration of structural elements.
    - b. Where partition and wall framing abuts overhead structure. Provide slip or cushioned type joints to attain lateral support and avoid axial loading.
  - 3. Isolation from Movement Joints: Do not bridge building expansion and control joints with metal framing or furring members; independently frame both sides of joints with framing or furring members.
  - 4. Runners/Tracks: Provide continuous tracks sized to match studs. Align runner tracks accurately to the partition layout at both floor and ceiling. Where partitions abut other construction, provide vertical runner track securely attached to construction. Secure runner tracks as recommended by the manufacturer for the floor and ceiling construction involved, except do not exceed 24 in. (600 mm) o.c. spacing for nails or power-driven fasteners, nor 16 in. (400 mm) o.c. for other

types of attachment. Provide fasteners at corners and ends of runner tracks.

- a. Install runners/tracks at floors, ceilings and structural walls and columns where stud system abuts other work, except as otherwise indicated. Install fasteners a maximum of 2 in. (50mm) from each corner and end of tracks.

5. Channel Studs: Space studs as shown on Drawings but no more than 16 in. (400 mm) on center, unless otherwise shown. Use full length studs between runner tracks wherever possible. If necessary, splice studs by nesting with a minimum lap of 8 in. (200 mm) and fasten laps with 2 screws through each flange. Friction fit studs to runner tracks by positioning and rotating into place. Provide positive attachment to runner tracks for studs located at partition corners and intersections, and adjacent to openings using 3/8 in. (10 mm) screws or stud clinching tool on both flanges of studs.
6. Furring Channels: Space furring channels not more than [16 in (400 mm)] o.c. maximum, unless otherwise noted. Secure to studs with self-tapping screws at each intersection. [Attach to concrete or masonry with tempered steel concrete nails.] Where splices occur, overlap ends not less than 8 in. (200 mm) with flanges interlocked and fastened, but do not splice furring channels between supports. Place channels within 2 in. (50 mm) of corners, abutments, framed openings or other interruptions in the continuity of the furring system.
7. Additional Framing: Provide additional framing, reinforcing and blocking as required to support gypsum board at openings and cutouts and to support built-in anchorage, fixtures, equipment, or similar construction and attachment devices.
5. Welded Frames: At welded frames with fixed anchor clips, secure stud reinforcing to jamb anchor clips with not less than two self tapping screws per clip.
7. Recessed Items: At fire rated partitions, where items are recessed, (including but not limited to metal toilet accessories and water fountains), comply with manufacturer's written installation instructions required to maintain partition rating.
8. Applied Fireproofing: If applied fireproofing has been installed, remove only as much fireproofing as needed to complete installation of gypsum board assemblies. Protect fireproofing that remains from damage.

**B. Panel Materials**

1. General: Install materials in accordance with ASTM C840, unless otherwise shown.
2. Provide boards thicknesses as shown on Drawings, but not less than 1/2 in. (12.5 mm) thickness for multi-layer construction, and 5/8 in. (16 mm) thickness for single-layer construction, unless otherwise noted.
3. Install gypsum board with face side out. Do not install imperfect or damaged boards, or if damp or wet.
4. Butt panel materials loosely together with not more than 1/16 in. (1.5mm) of open

space between panels. Install maximum practical lengths of panel materials to span walls with minimum number of end butt joints. Where butt joints are necessary, stagger joints and locate as far as possible from center of walls.

5. Fitting at Door Frames: Cut boards to fit around hardware reinforcement or mortar boxes. Spot grout the frames with joint compound at each jamb anchor clip just prior to inserting of boards into frame. Insert boards into frame so that its edge is fully bedded against inside surface of the frame. Butter the edge of boards with joint compound if necessary to obtain full bedding.
6. Edges and Ends: Locate both end joints over supports, except in ceiling applications where intermediate supports are provided. Position adjoining panels so that tapered edges abut tapered edges, and field-cut edges abut field-cut edges and ends. Stagger vertical joints over different studs on opposite sides of partition walls.
7. Walls: Apply panel materials on walls horizontally for ceiling heights less than 8 ft. (2500 mm). Where ceiling heights are over 8 ft. (2500 mm) or over or wall is 4 ft. (1.2m) wide or less, apply panels vertically.
8. Chase Walls: Unless otherwise shown, provide gypsum board braces not less than 1/2 in. (13 mm) thick by 12 in. (300 mm) wide and cut to width of chase. Locate at quarter points in wall height between each pair of parallel studs. Fasten with not less than 3 screws at each stud.
9. Control Joints: Install control joints as required by reference standards. In fire rated partitions, install control joints so that ratings are not compromised. Note locations of control joints on shop drawings and obtain Architect's approval. Install metal trim at exposed edges, frames, and other locations as shown. Fasten trim securely.
10. Curved Gypsum Board: Form curved gypsum board surfaces to provide a finish surface which is a smooth, even curve without flat faces or other imperfections.
7. Gypsum Board Multiple Layer Applications: Laminate face layer to base layer with laminating adhesive, with joints on surface spaced 10 in. (250mm) from the parallel joints in the base layer. For fire-rated construction, provide screw attachment or apply adhesive uniformly over entire back surface to comply with UL listing for the rating shown. For non-rated construction, apply adhesive in 3/8 in. (9mm) by 2 in. (50mm) beads and support as recommended by the gypsum board manufacturer until proper bond is developed.
8. Openings: Cut openings in panel materials for electrical outlets, piping and other penetrations. Maintain close tolerances so that edges will be covered by plates and escutcheons. Do not install electrical outlets back to back on opposing sides of partitions.
9. Partition Attachment Clips: Follow recommendation of exposed ceiling system manufacturer to comply with performance requirements and in Section 09 51 00 "Acoustical Ceilings". Install partition attachment clips a minimum of 2 ft. (600mm) on center, alternating direction of each clip.
10. Water-Resistant Gypsum Board: Treat joints and fastener heads with water-



resistant compound. Fill tapered edges in gypsum panel completely with water-resistant compound, embed reinforcing tape firmly, and wipe off excess compound. Immediately apply a second or skin coat over the taping coat, being careful not to crown joint or to leave excess compound. Apply water-resistant compound and tape to vertical angles in similar manner. Fill and seal openings around pipes, fittings and fixtures with water-resistant compound.

11. Shower Substrates: Cement board. At cement board manufacturer's recommendation, install vapor retarder on inside face of cement board. Tape vapor retarder to metal studs, overlapping film edges by 1 in. (25 mm). Completely seal edges with tape. Seal vapor retarder around any penetrations and openings in the cement board substrate.
12. Exterior Sheathing: Install in accordance with GA-253. Space fasteners in accordance with manufacturer's recommendations.
  - a. Apply silicone sealant on joints and fasteners and trowel flat. Apply sufficient quantity of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.
  - b. Apply glass-fiber sheathing tape to exterior sheathing joints and apply silicone sealant to embed sealant in entire face of tape. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

### **3.5 ADDITIONAL REQUIREMENTS FOR SOUND CONTROLLED PARTITIONS**

- A. General: Comply with ASTM C919 and manufacturer's recommendations. Apply acoustical sealant to each side of partitions at perimeters and at intersections. Size and place beads to ensure the STC rating of the wall system. Provide acoustical sealant behind control joints, around outlet boxes, and at perimeter of cutouts to completely seal openings and joints.
- B. Sealing of Double Layer Construction: After installation of gypsum board base layers, cut face layer sheets 1/2 in. (13 mm) less than full height and position with 1/4 in. (6 mm) open space between gypsum board and adjoining construction. Fill the 1/4 in. (6 mm) open space with continuous sealant bead after installation of face layer.
- C. Sound Attenuation Blankets: Install sound attenuation blankets (and/or sound attenuation fire blankets) in accordance with manufacturer's instructions. Form continuous layer for full height of partition and tightly abutting web of studs. [For installation above ceilings or soffits used as air plenums, provide only Kraft-faced or foil-faced insulation and tape all edges closed.] Fit carefully behind electrical outlets and other penetrations.
- D. Sound Flanking Paths: Where sound-rated partition walls intersect non-rated gypsum board partition walls, extend sound-rated construction to completely close sound flanking paths through non-rated construction. Caulk joints between face layers at vertical interior angles of intersecting partitions.
  1. Electrical Outlet Pads: Install over junction boxes within partitions containing sound attenuation fire blankets.

### **3.6 CEILING AND INTERIOR SOFFIT INSTALLATION**



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- A. Hangers: Provide sufficient hangers for runner channels on each side of light fixtures, ceiling diffusers and grilles, access panels and other items penetrating the ceiling. Attach to supporting construction by means of special insert or fastening devices. Space hangers not more than 48 in. (1220 mm) on center maximum and according to runner channel locations. Wrap each hanger around or through the supporting device and twist 3 times about itself to make secure.
  - 1. Where ceilings and soffits are suspended below ductwork, piping or other building elements not suitable for ceiling attachment, provide additional supplemental framing as required to span beneath these elements from suitable support locations.
- B. Runner Channels: Space runner channels not more than 48 in. (1220 mm) o.c. maximum, and provide shorter spacing where noted. Wrap or saddle tie each wire hanger twice around runner channel and twist 3 times about itself to make secure. Locate suspended runner channels within 6 in. (150 mm) away from walls and columns or other interruptions in continuity of the suspension system, but not contacting non-suspended construction. Accurately make plumb and level or align to designated position within tolerance of 1/8 in. (3 mm) for 12 ft. (3.7 m) at any point along length of channel.
- C. Furring Channels: Space hat furring channels not more than 24 in. (600 mm) on center maximum, and provide shorter spacing where noted. Secure to runner channels with special wire clips at each intersection. Where splices occur, overlap ends not less than 8 in. (200 mm) with flanges interlocked and fastened, but do not splice furring channels between supports. Place channels within 2 in. (50 mm) of corners, abutments, framed openings or other interruptions in the continuity of the furring system. Fasten panel materials with screws to furring channels at 12 in. (300mm) on center.

### 3.7 SUSPENDED EXTERIOR SOFFIT INSTALLATION

- A. General: Install exterior soffits in accordance with specified performance criteria and ASTM C754. Provide brass wedges and other materials as required to make metal furring installation rigid. Frame openings with furring strips so that recessed items finish flush. Provide cross-bracing and additional framing as required to resist wind uplift.
- B. Apply exterior gypsum soffit board perpendicular to supports, with end joints staggered over supports. Install with 1/4 in. (6mm) open space where boards abut other construction. Fasten with corrosion resistant screws as recommended by the manufacturer.
- C. Finish exterior gypsum soffit board using setting-type joint compounds to prefill joints and embed tape, and for first, fill (second) and finish (third) coats, with the last coat being a sandable product. Smooth each coat before joint compound hardens to minimize need for sanding. Sand between coats and after finish coat.

### 3.8 ACOUSTICAL PLASTER

- A. Inspection And Preparation
  - 1. Examine all substrate and condition.
  - 2. Building must be fully enclosed and weather tight.
  - 3. Do not apply finish coats when temperatures are below 55°



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- 4. Perform all patching and repairing of material required to be done due to cutting, etc. by other trades.
- B. Application
  - 1. Apply in accordance with manufacturer's printed instructions:
    - a. Install 1 ½ inch cold rolled channel on 4 foot centers and 20 gauge 7/8 inch hot channel on 400mm centers.
    - b. Fasten StarSilent panels to ceiling or wall framing.
    - c. Apply StarSilent fix to panel edges and over fasteners.
    - d. Sand over fasteners and panel seams.
    - e. Apply StarSilent Top Basic over entire surface.
    - f. Apply StarSilent Top Finish over entire surface and trowel to smooth plaster finish.
- C. Coordinate work with other trades when work may be affected or have an impact on the installation.
- D. Cleaning And Patching
  - 1. Remove fallout material immediately upon completion of the work in each area. Clean surfaces to remove evidence of soiling. Repair or replace damaged work surfaces to acceptable conditions.
  - 2. Coordinate work with other work, to minimize possibility of damage to system resulting from performance of subsequent work. As other units of work are completed in each area, patch damaged areas or surfaces of insulation by patching procedures as required to provide acceptable results.
  - 3. Provide natural or mechanical ventilation as required to properly cure the acoustical finish installation.
  - 4. Dispose of all waste materials in a proper and legal manner.

### 3.9 GENERAL FINISHING REQUIREMENTS

- A. General: Finish panel materials in accordance with ASTM C840.
  - 1. Areas Exposed to View: [Level 5] [Level 4].
  - 2. Non--Public Spaces such as mechanical equipment rooms, elevator machine rooms, electrical closets, utility rooms and other similar type rooms not exposed to view: [Level 4] [Level 3].
  - 3. Panel Materials Used as Substrate for Tile: Level 2.

### 3.10 FIELD QUALITY CONTROL



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- A. Contractor's Quality Control Responsibilities: Contractor is solely responsible for quality control of the Work.
- B. Tolerances
  - 1. Light gauge framing within 1/8 in. (3mm) in 10 ft. (3m) (non-cumulative) for plumbness and level, +/- 1/8 in. (3mm) for fastening surfaces of adjacent framing members and for deviation from specified spacing.
  - 2. Finish board surfaces within 1/4 in. (6mm) in 10 ft. (3m) (non-cumulative) for plumb, level, warp and bow.
  - 3. Finish board surfaces within +/- 1/4 in. (6mm) from plan location.
  - 4. Finish board surfaces within 1/16 in. (1.5mm) between planes of board faces.

**3.11 CLEANING**

- A. Clean-Up: Remove gypsum board debris, excess material, scaffolding, tools and other equipment upon completion of the Work. Leave floors broom clean.

**3.12 PROTECTION**

- A. General: Protect fixtures, frames, inserts and other contiguous work from rusting, soiling or clogging due to gypsum board installation. Protect and maintain the work so that it will be without damage at the time of acceptance by the Owner.

**END OF SECTION**

**SECTION 09 30 00  
TILING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. General: Provide tiling in accordance with requirements of the Contract Documents.
- B. Related Work Specified Elsewhere:
  - 1. Section 01 81 13 "Sustainable Design Requirements" for additional references, definitions, documentation requirements, action plans, meetings, and performance requirements of products and systems.
  - 2. Stone tiles are specified in Section 04 30 00 "Stonework".
  - 3. Sealants and joint fillers are specified under Section 07 92 00 "Joint Sealants".
  - 4. Scratch coat over metal lath for wall surfaces is specified in Section 09 21 13 "Plaster Assemblies".

**1.2 REFERENCES**

- A. General: Comply with the applicable provisions and recommendations of references, except as modified by governing codes and by the Contract Documents. Where a recommendation or suggestion occurs in the references, such recommendation or suggestion shall be considered mandatory. In the event of conflict between references, this specification or within themselves, the more stringent standard or requirement shall govern.
- B. American National Standards Institute
  - 1. ANSI A137.1 "Standard Specifications for Ceramic Tile."
  - 2. ANSI A108/A118/A136 "Standard Specifications for the Installation of Ceramic Tile."
- C. International Organization for Standardization (ISO):
  - 1. ISO 13007-1 "Ceramic tiles - Grouts and adhesives - Part 1: Terms, Definitions and Specifications for Adhesives".
  - 2. ISO 13007-2 "Ceramic tiles - Grouts and adhesives - Part 2: Test Methods for Adhesives".
  - 3. ISO 13007-3 "Ceramic Tiles - Grouts and Adhesives - Part 3 Terms, Definitions and Specifications for Grouts".
  - 4. ISO 13007-4 "Ceramic Tiles - Grouts and Adhesives - Part 4: Test Methods for Grouts".
- D. Tile Council of North America: TCNA "Handbook for Ceramic Tile Installation".

### **1.3 DEFINITIONS**

- A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. Module Size: Actual tile size plus joint width indicated.
- C. Face Size: Actual tile size, excluding spacer lugs.

### **1.4 SYSTEM DESCRIPTION**

- A. Performance Requirements
  - 1. Slip Resistance (COF) Values: Tile indicated to be used on floor surfaces, as manufactured, shall bear a coefficient of friction of not less than 0.6 for horizontal surfaces and stair treads and 0.8 for ramps or inclined surfaces when tested in accordance with ASTM C1028 under both wet and dry conditions.
  - 2. Slip Resistance (COF) Values: Tile indicated to be used on floor surfaces, as manufactured, shall bear a dynamic coefficient of friction (DCOF) of not less than 0.42 for horizontal surfaces when tested in accordance with ANSI A137, DCOF AcuTest Method.

### **1.5 SUBMITTALS**

- A. Product Data: Submit for Architect's action. Submit manufacturer's technical literature and specifications describing the general properties of each material and accessory to be used in the Work. Including installation instructions for each material required.
- B. Shop Drawings: Submit for Architect's action. Submit shop drawings for the fabrication and installation of the Work. Provide shop drawings for the following:
  - 1. Tile patterns and locations based on as built dimensions showing start points.
- C. Samples: Submit for Architect's action. Label samples to indicate product, characteristics, and location in the Work. Samples will be reviewed for color and appearance only. Furnish sufficient samples to establish the full range of colors and textures for materials exposed in the finished work. Compliance with other requirements is the responsibility of the Contractor. Submit the following:
  - 1. Samples of each type, class and color of tile, not less than 12 in. (300mm) square on plywood backing, and grouted as required.
  - 2. One sample of each type of tile trim and accessory.
- D. Quality Control Submittals: Submit the following for Architect's information:
  - 1. Certificates
    - a. Document Review: Before commencing work, submit a written statement signed by the Contractor and the Applicator certifying that the Contract Documents, shop drawings and product data have been reviewed with material manufacturers' qualified technical representatives and that they

agree the selected materials are proper, compatible with contiguous materials and adequate for the application shown.

- b. Certificate of Compliance to ANSI A137.1 prior to submission of samples for review.
  - c. "Master Grade Certificate" in the form approved in ANSI A137.1 for each type of tile, signed by the manufacturer, certifying to the grade, type and quantity of tile, together with satisfactory information for identification of the containers to which they apply. These certificates shall be supplied promptly after material has been shipped from the factory.
  - d. Certification from the manufacturers of dry-set mortar and grouts that their products conform to the appropriate ANSI "Materials" specifications.
  - e. Certified statement issued by the manufacturers of tile setting materials and countersigned by the tile installer, attesting that areas and surfaces designated to receive ceramic tiles have been inspected and found satisfactory for the reception of the tile, and are not in conflict with the referenced standards requirements. Application of tile will be construed as acceptance of surfaces.
- 2. Installer's Qualifications: Evidence of successful completion of work of similar scope to that shown and specified for this Project.
  - 3. Manufacturer's Qualifications: Evidence that the specified materials have been manufactured by the same source and successfully utilized for a minimum of 5 years on projects of a similar scope to that shown and specified for this Project.
- E. Closeout Submittals: Submit for Owner's documentation.
- 1. Warranties: Special warranties as specified.
  - 2. Maintenance Manuals: Describing the materials and procedures to be followed in cleaning and maintaining the tiling Work. Include manufacturers' brochures and instruction sheets describing the actual products used in the Work, including tile, adhesive, mortar, grout, sealer, and related components.

## **1.6 QUALITY ASSURANCE**

- A. Installer Qualifications: Engage an experienced Installer who has successfully completed tiling installations similar in material, design, and extent to that indicated for Project.
- B. Single-Source Responsibility
  - 1. Single-Source Responsibility for Tiling: Obtain each color, grade, finish, type, composition, and variety of tile from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.
  - 2. Single-Source Responsibility for Setting and Grouting Materials: Obtain ingredients of a uniform quality from one manufacturer for each cementitious and admixture component and from one source or producer for each aggregate.

- 3. Single-Source Responsibility for Waterproofing/Crack Suppression Materials: Obtain waterproofing/crack suppression materials and associated accessories from one manufacturer for each type waterproofing system.
- C. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from such authorities.
- D. Pre-Installation Meeting: Prior to the installation of tile, meet at the project site to review the material selections, substrate preparations, installation procedures, coordination with other trades, special details and conditions, standard of workmanship, and other pertinent topics related to the Work.

#### **1.7 DELIVERY, STORAGE AND HANDLING**

- A. Packing, Shipping Handling and Unloading: Deliver materials, other than bulk materials, in manufacturer's unopened containers fully identified with grade labels as specified in ANSI 137.1, and with name, brand, type, class, size, color and pattern. Store materials above grade and protect from weather and damage from any source. Store in accordance with manufacturer's instructions. Prevent damage or contamination to materials by water, freezing, foreign matter, and other causes.
- B. Handling: Handle tile with temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If despite these precautions coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

#### **1.8 PROJECT CONDITIONS**

- A. Project Conditions: Maintain project conditions and protect the Work during and after installation as required to comply with referenced standards, manufacturer's written recommendations and instructions. Vent temporary heaters to exterior to prevent damage to tiling work from carbon dioxide buildup.
- B. Temperature Maintenance: Maintain temperatures at 50 deg. F. (10 deg. C.) or more in tiled areas during installation and for 7 days after completion, unless higher temperatures and/or longer cure times are required by referenced installation standard or manufacturer's instructions.

#### **1.9 MAINTENANCE**

- A. Extra Materials: Furnish to the Owner, delivered and stored where directed at the job site, a quantity of tile, grout and trim shapes equal to 2 percent of amount installed, but not less than one unopened box, for each type, composition, color, pattern and size properly packaged and identified with labels clearly describing contents.

#### **1.10 WARRANTY**

- A. Warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and are in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.
- B. Special Warranty: Provide a written warranty, directly to the Owner, for a two (2) year



period, agreeing to repair or replace Work which has failed as a result of defects in materials or workmanship. Upon notification of such defects, within the warranty period, make the necessary repairs and replacements, at the convenience of the Owner. Warranty shall be signed by the Contractor, the manufacturer and the applicator.

## **PART 2 - PRODUCTS**

### **2.1 TILING MATERIALS**

- A. General: Provide tile "Standard Grade", complying with ANSI A137.1. Tile shall match samples approved by the Architect. Obtain each material required for any one type and color of tiling work from a single source, so as to minimize variations in appearance and quality.
- B. Ceramic Wall Tile: Non-vitreous white body with matte or gloss finish, cushion edged, spacer lugs on all four sides; 4-1/4 in. (108mm) sq., 5/16 in. (8mm) thick unless otherwise shown or specified; Colors as specified in the Tile Schedule. (Architect reserves the right to use 16 tile sheets pregrouted with white silicone sealant).
- C. Quarry Tile: Vitreous body, unglazed, square or cushion edged; 6 in. (150mm) square, 1/2 in. (13mm) thick unless otherwise shown or specified. Where slip-resistance quarry tile is shown or specified, surface shall include embedded aggregate. Provide a 6 in. (150mm) high sanitary cove in areas shown, specified or required by code authorities having jurisdiction. Colors as specified in the Tile Schedule.
- D. Glazed Porcelain Paver Tile: Vitreous body, cushion edged, 12 in. (300mm) square, 5/16 in. (8mm) thick. Surface finish shall be commercially rated glaze with minimum "Mohs" rating 6.5 and a coefficient of friction rating of 0.65 or better.
- E. Cementitious Terrazzo Tile: Patterned Cement terrazzo tile 12 in. (300mm) square, 5/8 in. (16mm) thick. Surface finish shall be commercially rated glaze with minimum coefficient of friction rating of 0.51 or better.
- F. Trim Shapes: Shaped as shown for typical conditions and as required to make a complete installation at all conditions including required cove type bases, bull-nosed round external corners and square internal corners. Wainscots shall be topped with bullnose trim. Match type, class, color and edge of adjoining field units and coordinate sizes with field units.

### **2.2 SETTING MATERIALS**

- A. Basic Setting Materials
  - 1. Portland Cement: ASTM C150, Type I; white where required to match Architect's sample.
  - 2. Hydrated Lime: ASTM C206, Type S, or ASTM C207, Type S.
  - 3. Sand: ASTM C144.
- B. Portland Cement Mortar: Comply with ANSI A108 Standards for mixes.
- C. Dry Set Mortar: Factory pre-mixed. Comply with ANSI A118.1.

- D. Thick Bed Leveling Mortar: Comply with ANSI A108.1A; proprietary mortar for leveling beds, factory proportioned in dry blend to be mixed with specified manufacturer's liquid additive. Suitable for mortar bed up to 2 in. (50mm) thickness. Provide one of the following:
1. "Fast Setting Thick Bed Mortar " with "Thin-Set Admix" (Custom Building Products).
  2. "254 Platinum" (Laticrete International, Inc.).
  3. "Planicrete AC" (Mapei Corp).
- E. Latex Portland Cement Thin Set Mortar: ANSI A118.4, liquid acrylic or SBR resin type latex modified cement mortar for thin set application. Factory proportioned cement, sand and polymer additives in dry blend to be mixed with water. Provide one of the following:
1. "TEC Super Flex Premium Latex Mortar" (H.B. Fuller).
  2. "254 Platinum Multi-Purpose Thin-Set Mortar" (Laticrete International, Inc.).
  3. "Granirapid" with "Granirapid Liquid Latex Additive" with (Mapei Corp) or "KeraFlor Mortar" with "Keraply" additive (Mapei Corp).
  4. "MegaFlex Thin-Set Mortar" (Custom Building Products).
- F. Organic Tile Adhesive: ANSI A136.1, Type 1, water resistant latex emulsion, with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24). Provide one of the following:
1. "Hydroment Multi-Purpose Mastic" (Bostik, Inc.).
  2. "TEC Double Duty Ceramic Tile Adhesive for Walls and Floors TA-122" (H.B. Fuller).
  3. "Laticrete 15 Multi Mastic Adhesive" (Laticrete International, Inc.).
  4. "Type 1 Adhesive" (Mapei Corp).

## **2.3 WATERPROOFING AND CRACK SUPPRESSION MATERIALS**

- A. Polyethylene Sheet Waterproofing and Crack Suppression Membrane for Thin Set Tile Floors: Manufacturer's standard proprietary product complying with ANSI A118.10 and consisting of composite sheets, 60 in. (1524 mm) wide by a nominal thickness of 0.030 in. (0.8mm) minimum, composed of an inner layer of chlorinated polyethylene (CPE) sheet faced on both sides with laminated high-strength nonwoven polyester material. Provide preformed outside and inside corners, pipe protrusion collars, cap strips, seaming adhesive and other accessories as required for a complete waterproof installation. Provide one of the following:
1. "NobleSeal TS" (The Noble Co.).
  2. "NobleSeal TS" (American Olean).
  3. "Composeal Gold" (Compotite Corp.)

- B. Polyethylene Sheet Waterproofing and Crack Suppression Membrane for Full Mortar Set Tile Floors: Manufacturer's standard proprietary product complying with ANSI A118.10 and consisting of non-plasticized chlorinated polyethylene (CPE) sheet, 60 in. (1.5m) wide by a nominal thickness of 0.040 in. (1mm). Provide preformed outside and inside corners, pipe protrusion collars, cap strips, seaming adhesive and other accessories as required for a complete waterproof installation. Provide one of the following:

1. "Chloraloy 240" (The Noble Co.).
2. "Chloraloy 240" (American Olean).
3. "Chloraloy 240" (Dal-Tile).

## **2.4 GROUTING MATERIALS**

- A. Epoxy Grout: ANSI A118.3 chemical-resistant and water cleanable epoxy grout with 100% solids content; color as shown or as required to match Architect's sample; Provide one of the following:

1. "100% Solids Epoxy Grout" (Custom Building Products).
2. "TEC AccuColor EFX" (H.B. Fuller).
3. "SpectraLock 2000 IG Industrial Grade Epoxy Grout" (Laticrete International, Inc.).
4. "Kerapoxy CQ Grout" (Mapei Corp).

## **2.5 AUXILIARY MATERIALS**

- A. Stone Thresholds

1. STN-01 – Taivassalo Granite in Profiles Shown
2. STN-02 - Marble Saddles: Fabricate from highest grade Madre Cream Alabama or Georgia White marble, having an minimum abrasion hardness (Ha) of 10.0 when tested in accordance with ASTM C241, thickness as shown with chamfered corners and eased edges, cut from sound stock, uniform in color, free from cracks, and spalled edges. Honed finish on exposed surfaces.

- B. Water: Clear, potable, and without deleterious substances which would impair the work.

- C. Pigments: Pure mineral pigments, resistant to alkalis, non-fading and weatherproof, colors as required to match Architect's sample.

- D. Reinforcement: A185 (A185M), 2 in. (50mm) x 2 in. (50mm) x 14 gauge (2mm) welded wire mesh, galvanized.

- E. Metal Lath: 3.4 lbs. per sq. yard (1.8kg per m<sup>2</sup>) expanded, self-furring, zinc coated metal lath, with zinc coated nails and galvanized wire anchorage.

- F. Cleavage Membrane: ASTM D226 Type I, 15 lbs. (6.8kg) asphalt saturated, unperforated roofing felt, or 4-mil (0.10mm) polyethylene film complying with ASTM D2103.

- G. Primer or Slurry Bond Coat (for Substrate): As recommended by manufacturer of setting bed.
- H. Metal Edge Strip: Angle or L-shape, height to match tile and setting-bed thickness. Fabricated from zinc alloy or stainless steel strips, designed specifically for flooring applications, 1/8 in. (3mm) wide at top edge with integral provision for anchorage to mortar bed or substrate.

## **2.6 MIXING MORTARS AND GROUT**

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

## **2.7 TILE SCHEDULE**

- A. Tile Type TL-01: Porcelain Floor Tile 24"x24" Matte White cut to 12" x 12" squares Moonlight Square Grande (DalTile) Color Code OU56m 5/16" thick.
- B. Tile Type TL-02: Ceramic Wall Tile, 3"x12" Flash White (Arizona Tile)
- C. Tile Type QT-1: Quarry Tile 6"x6" Blaze Flash 0Q41 (DalTile)
- D. Tile Type TZ-01: Square Cement Terrazzo 12"x12" Guava (Zia Tile)

## **PART 3 - EXECUTION**

### **3.1 GENERAL**

- A. Manufacturer's Instructions: Prepare substrates and apply the work of this Section, including components, and accessories in accordance with the manufacturer's instructions, except where more stringent requirements are shown or specified, and where project conditions require extra precautions or provisions to ensure satisfactory performance of the Work.

### **3.2 EXAMINATION**

- A. General: Examine the substrates, adjoining construction and the conditions under which the Work is to be installed. Do not proceed with the Work until unsatisfactory conditions have been corrected. Verify that substrates for setting tile are firm, dry, clean, and free from oil laitance, waxy films and curing compounds. Confirm that installation of grounds, anchors, recessed frames, electrical, plumbing and mechanical elements, and similar items located in or behind tiling has been completed prior to beginning the Work. Verify that backing plates are installed in a manner that will not permit telescoping through installed tile. There shall be no visible detection of location backing plates after tile is installed.
- B. Allowable Variations in Substrate Levels

1. Mortar Set Floors: +/- 1/4 in. (6mm) in 10 ft. (3m) distance and 3/8 in. (9mm) total maximum variation from levels shown.
  2. Mortar Set Walls: +/- 1/4 in. (6mm) in 8 ft. 0 in. (2.4m) distance and 1/4 in. (6mm) total maximum variation from planes shown.
  3. Mortar Set Ceilings: Same as walls.
  4. Thin-Set Work: Same as allowable variations in finished work.
- C. Grind or fill concrete, masonry and plaster substrates as required to comply with allowable variations.

### **3.3 PREPARATION**

- A. Substrate Acceptability: Commencement of installation shall constitute acceptance of substrate conditions by the Installer.
- B. Scarification: Mechanically scarify concrete substrate by sandblasting, grinding or a portable shot blast cleaning system as may be required to provide a proper surface or to remove curing compounds or other surface contaminants that would interfere with proper bond of mortar, waterproofing membrane, or adhesive for tile.
- C. Sealing of Substrates: Seal substrate with sealer if required.
- D. Blending: For tile exhibiting color variations within the ranges selected during sample submittals, verify that tile has been blended in factory and packaged accordingly so that tile units taken from one package show the same range in 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.

### **3.4 INSTALLATION**

- A. Mixing: Mix mortars and grouts to comply with requirements of referenced standards including those for accurate proportioning of materials, water, or additive content; type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other procedures needed to produce mortars and grouts of uniform quality with optimum performance characteristics for application indicated.
- B. Allowable Variations in Finished Work: Do not exceed the following deviations from level and plumb, and from elevations, locations, slopes and alignments shown:
1. Floors: 1/8 in. (3mm) in 10 ft. (3m) run, any direction; +/- 1/8 in. (3mm) at any location; 1/32 in. (0.8mm) offset at any location.
  2. Walls: 1/8 in. (3mm) in 8 ft. (2.8m) run, any direction; +/- 1/8 in. (3mm) at any location; 1/32 in. (0.8mm) offset at any location.
  3. Joints: +/- 1/32 in. (0.8mm) joint width variation at any location; 1/16 in. (1.5mm) in 3 ft. (900mm) run for deviation from plumb and true, and for other variations in alignment of joints.
  4. Counters: Same as floors.

5. Ceilings: Same as walls.
- C. Lay Out: Lay out tiling in pattern shown using field tile and trim shapes as shown or required. Center tile fields both directions in each space or on each wall area and adjust to minimize tile cutting. Use uniform joint widths of 1/16 in. (1.5mm) for ceramic tile and 1/4 in. (6mm) for quarry tile unless otherwise shown. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Adjust to minimize tile cutting. Cut field tile, not trim shapes, unless otherwise shown. 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 that plates, collars or covers overlap tile. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so that extent of each sheet is not apparent in finished work.
- D. Extend tiling into recesses and under equipment and fixtures in the spaces shown or scheduled to receive tile. Form a complete covering without interruptions except for control and expansion joints as shown and as required to comply with requirements. Terminate work neatly at obstructions, edges and corners without disruption of pattern or joint alignments.
- E. Porcelain Paver Tiles: When setting porcelain paver tiles, wash tiles thoroughly, back butter tile and push and twist each tile in proper position in accordance with manufacturer's instructions.

### **3.5 WATERPROOFING AND CRACK SUPPRESSION MATERIAL INSTALLATION**

- A. General: Install waterproofing and crack suppression materials to comply with ANSI A108.13 to produce waterproof and crack suppression membrane of uniform thickness bonded securely to substrate. Do not install tile over waterproofing and crack suppression materials until system has cured and been tested to determine that it is watertight.
- B. Trowel Applied Waterproofing Membrane and Crack Suppression Materials Installation: Where required, use membrane waterproofing and crack suppression material tile adhesive to set tile flooring. Seal penetrations of pipes, conduits, fixtures and drains.
- C. Sheet Waterproofing and Crack Suppression Materials Installation: In areas shown, install sheet waterproofing and crack suppression material. Adhesively bond seams with recommended seaming adhesive. Bond membranes to substrates at corners, transitions, drains and penetrations with full bed of adhesive. Position seams so that water would flow over and not against laps in direction toward drains. Turn up sheet membrane waterproofing onto vertical surfaces so that top edge of membrane is not less than 6 in. (150mm) above the completed tile floor surface-and neatly fasten. Seal corners and seams, penetrations of pipes, conduits, fixtures and drains watertight.
1. Shower Pan Waterproofing: Provide specified sheet waterproof membrane. Bonding to substrates with full bed of adhesive. Position seams so that water would flow over and not against laps in direction toward drains. Seal corners and seams watertight with laps not less than 3 in. (75 mm) wide, and flash membrane to drains. Turn membrane up onto vertical surfaces so that top edge of membrane is not less than 6 in. (150 mm) above the completed tile floor surface.
- D. Trowel Applied Latex Cement Waterproofing and Crack Suppression Membrane: Comply

with ANSI A118.10. Mix liquid and powder to form a plastic trowelable paste, and apply in multiple layers with continuous fiberglass mesh reinforcement to form a seamless waterproof membrane. Trowel first coat to approximately 1/16 in. (1.5mm) thickness. Place a layer of fiberglass fabric reinforcing with 2 in. (50mm) overlaps, and turn up edges at perimeter. Trowel second coat to approximately 1/16 in. (1.5mm) thickness over reinforcing fabric and finish smooth. Feather-edge the membrane at perimeter, so that tile applied over membrane shall have uniformly smooth transition without abrupt changes.

- E. Reinforcement: Install reinforcement in horizontal mortar setting beds over membrane waterproofing.

### **3.6 TILE INSTALLATION**

- A. Setting Tile on Portland Cement Mortar Setting Bed: Use latex modified dryset mortar to set tile on Portland cement mortar setting bed. If dry-set mortar is used, compact and level the Portland cement mortar setting bed accurately and allow it to set firmly before installing tile. Comply with TCNA Method F113 at concrete floor and F144 at wood floor, ANSI A108.1B and ANSI A108.5 for installation of tile by the thin set method
- B. Adhesive Installation: Use organic tile adhesive for setting tile on gypsum wallboard and elsewhere as shown. Comply with TCNA Methods W223 or W242 and ANSI A108.4 for installation of tile.
- C. Countertop Installation: Adhesive installation unless otherwise shown or required. Comply with TCNA Method C512 and ANSI A108.4 for installation of tile.
- D. Grout: Unless otherwise shown use factory pre-mixed grout with latex additive specified for non-vitreous body tile, porcelain body tile and for quarry tile. Comply with the following for grouting: ANSI 108.10.
- E. Epoxy Grout Installation: Use epoxy grout where shown. Comply with the following for grouting: ANSI 108.6.
- F. Slip-Resistant Tile Installation: Use slip-resistant tile in areas shown as "Slip-Resistant". Install as specified for normal ceramic tile or quarry tile of the same type and class.

### **3.7 MISCELLANEOUS MATERIALS INSTALLATION**

- A. Metal Edge Strip Installation: Install a continuous metal edge strip adequately anchored into the substrate as follows:
  - 1. Where shown.
  - 2. Where ceramic tile flooring meets other floor covering.
  - 3. Where exposed edge is raised above base flooring to meet "future floor covering".
- B. Marble Saddles: Install in one piece, fit neatly to door jambs and set in same type of setting bed as abutting field tile unless otherwise indicated. Set thresholds in latex-Portland cement mortar for locations where mortar bed would otherwise be exposed above adjacent non-tile floor finish. Comply with TCNA Method TR611.

### **3.8 ADJUSTING**



**SECTION 09 30 00  
TILING**

**DIVISION 09**

- A. Upon completion of the Work repair surfaces that have been permanently stained, marred, or otherwise damaged. Replace tiles which are damaged or cannot be adequately cleaned as directed

**3.9 CLEANING**

- A. In addition to the initial cleaning procedure required, and not more than 2 days before occupancy or preliminary acceptance by the Owner, clean ceramic tiling as recommended by the TCNA.

**3.10 PROTECTION**

- A. Protect tiling during the construction period so that it will be without indication of use or damage at the time of acceptance.

**END OF SECTION**



**SECTION 09 51 00  
ACOUSTICAL CEILINGS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. General: Provide acoustical ceilings in accordance with requirements of the Contract Documents.
- B. Related Work Specified Elsewhere:
  - 1. Section 01 81 13 "Sustainable Design Requirements" for additional references, definitions, documentation requirements, action plans, meetings, and performance requirements of products and systems.
  - 2. Sprinkler heads and fire protection devices are specified in applicable Division 21 and Division 28 Mechanical Specifications sections.
  - 3. Air supply, ducts, connections and diffusers are specified in applicable Division 23 Mechanical Specifications sections.
  - 4. Lighting fixtures attachments devices are specified in applicable Division 26 Electrical specification sections.

**1.2 REFERENCES**

- A. General: Comply with the applicable provisions of the referenced standards except as modified by governing codes and the Contract Documents. Where a recommendation or suggestion occurs in the referenced standards, such recommendation or suggestion shall be considered mandatory. In the event of conflict between referenced standards, this specification or within themselves, the more stringent standard or requirement shall govern.
- B. ASTM International
  - 1. ASTM E1264 "Standard Classification for Acoustical Ceiling Products".
  - 2. ASTM C423 "Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method."
  - 3. ASTM C635 "Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings".
  - 4. ASTM C636 "Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels ".
  - 5. ASTM E84 "Standard Test Method for Surface Burning Characteristics of building Materials."
  - 6. ASTM E795 "Standard Practices for Mounting Test Specimens During Sound Absorption Tests."
  - 7. ASTM E580 "Standard Practice for Installation of Ceiling Suspension Systems for



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Acoustical Tile and Lay-In Panels in Areas Subject to Earthquake Ground Motions".

- C. International Code Council Evaluation Service (ICC) AC156: "Acceptance Criteria for Seismic Qualification Testing of Non-Structural Components".
- D. National Association of Architectural Metal Manufacturers (NAAMM): NAAMM "Metal Finishes Manual".
- E. Technical Association of Industrial Metal Ceiling Manufacturers (TAIM)
  - 1. "Technical Manual on Metal Ceilings".
  - 2. "Quality Standard for Metal Tiles and Metal Planks".
  - 3. "Instructions for Installation and Application".

**1.3 SYSTEM DESCRIPTION**

- A. Performance Requirements
  - 1. The project is is Seismic Category D
  - 2. Building Movement: Engineer, fabricate and install acoustical ceiling systems to withstand building movements including loading deflections, shrinkage, creep, thermal, and similar movements. Engineer for simultaneous occurrence of all specified movements. No reductions shall be applied to individual movements or to combinations of movements.
  - 3. Primary Suspension System Deflection Criteria: Finish to lines and levels shown, with maximum deflection not to exceed 1/360 of the span between supports.
  - 4. Fire-Performance Characteristics: Provide acoustical ceilings that are identical to those tested for the following fire-performance characteristics, per ASTM test method indicated below, by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction. Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.
    - a. Surface Burning Characteristics: As follows, tested per ASTM E 84 and complying with ASTM E 1264 for Class A products.
      - 1) Flame Spread: 25 or less.
      - 2) Smoke Developed: 50 or less.
  - 5. Seismic Standard: Provide acoustical ceiling systems designed and installed to withstand the effects of earthquake motions in compliance with the following:
    - a. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E580.
    - b. Cisca's Recommendations for Acoustical Ceilings: Comply with Cisca's "Recommendations for Direct-Hung Acoustical Tile and Lay-in



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ACOUSTICAL CEILINGS**

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Panel Ceilings--Seismic Zones 0-2."

- c. CISCA's Guidelines for Systems Requiring Seismic Restraint: Comply with CISCA's "Guidelines for Seismic Restraint of Direct-Hung Suspended Ceiling Assemblies--Seismic Zones 3 & 4."
- d. UBC Standard 25-2, "Metal Suspension Systems for Acoustical Tile and for Lay-in Panel Ceilings."

**1.4 SUBMITTALS**

- A. Product Data: Submit, for Architect's action, manufacturer's data sheets or equivalent printed technical literature indicating product information correlated to specified requirements and containing specifications and installation instructions for each acoustical material, suspension system and other products required, including certified laboratory test reports and other data as may be required to show compliance with the Contract Documents.
- B. Shop Drawings: Submit, for Architect's action, details and reflected ceiling plans of each type of acoustical ceilings before proceeding with Work. Provide coordination drawings for reflected ceiling plans drawn accurately to large scale and coordinating penetrations and ceiling-mounted items. Show the following:
  - 1. Complete layout of acoustical ceiling systems based on field verified dimensional relationships to adjoining work and installation tolerances. Layout shall note locations, patterns and layouts of each metal ceiling system.
  - 2. Details with descriptive notes indicating materials, finishes, fasteners, typical and special edge conditions, accessories, suspension structure, and other data to permit a full evaluation of each acoustical ceiling system
  - 3. Joint pattern.
  - 4. Ceiling suspension members.
  - 5. Method of attaching hangers to building structure.
  - 6. Ceiling-mounted items including light fixtures; air outlets and inlets; speakers; sprinkler heads; access panels; and special moldings at walls, column penetrations, and other junctures with adjoining construction.
  - 7. Schedule Of Acoustical Ceiling Systems: As part of shop drawing submittal, submit a complete schedule of acoustical ceiling systems including specified suspension systems utilizing reference numbers as noted on the drawings for each acoustical metal ceiling system shown.
- C. Samples: Submit for Architect's action. Label samples to indicate product, characteristics, and location in the Work. Samples will be reviewed for color and appearance only. Furnish sufficient samples to establish the full range of colors and textures for materials exposed in the finished work. Compliance with other requirements is the responsibility of the Contractor Provide the following:
  - 1. Acoustic tile: Full size.



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2. Open Grid: 6 in. (150mm) sq. including suspension components
  3. Exposed tees and moldings (one of each type): 12 in. (300mm) lengths.
  4. Accessories: one of each type.
- D. Quality Control Submittals: Submit the following for Architect's information:
1. Product Test Reports: Provide product test reports for each type of acoustical ceiling system based on evaluation of comprehensive tests performed by a qualified testing agency and correlated to specified requirements. Provide the following:
    - a. Laboratory test reports for each acoustical ceiling product with specified Noise Reduction Coefficient (NRC) and Sound Transmission Class (STC).
    - b. Provide test data that the systems have been tested per International Code Council – Evaluation Services – AC 156 Acceptance Criteria for Seismic Qualification Testing of Non-structural Components as evidenced by International Code Council Evaluation Report, ESR-1308.
  2. Certificates:
    - a. Document Review: Before commencing work, submit a written statement signed by the Contractor and the Installer certifying that the Contract Documents, shop drawings and product data have been reviewed with material manufacturers' qualified technical representatives and that they agree the selected materials are proper, compatible with contiguous materials and adequate for the application shown.
    - b. Provide certification for acoustical performance that each carton of material carries an approved independent laboratory classification of NRC, CAC, and AC.
    - c. Proved certification for seismic performance in accordance with the International Code Council Evaluation Report, ESR-1308.
  3. Installer's Qualifications: Evidence of successful completion of work of similar scope to that shown and specified for this Project.
  4. Manufacturer's Qualifications: Evidence that the specified materials have been manufactured by the same source and successfully utilized for a minimum of 5 years on projects of a similar scope to that shown and specified for this Project.
- E. Closeout Submittals: Submit the following for Owner's documentation
1. Special Warranties: As specified.
  2. Maintenance Data: Instructions for maintenance and cleaning of each type of acoustical ceiling system.



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### **1.5 QUALITY ASSURANCE**

- A. Single-Source Responsibility: Obtain each type of acoustical ceiling system, for the entire project, from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.
- B. Qualified Installer: The acoustical ceiling work shall be performed by an installer having 5 years experience in the installation of materials specified herein on projects comparable to this Project. The installer shall have the approval of the acoustical materials manufacturer.
- C. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from such authorities.
  - 1. Fire-Rated Acoustic Ceiling Assemblies: Provide ceiling assemblies to achieve the fire-resistance classification or rating shown. Comply with the material and installation requirements of the UL "Building Materials List", Guide No. 40 U 18 and other referenced guides for the UL design numbers corresponding with the construction systems shown.
    - a. Provide complying protection for recessed light fixtures and other penetrations in ceilings where required for applicable UL approved design.
    - b. Provide complying ceiling access units as shown or where required.
  - 2. Seismic Performance: System seismic performance verified through full-scale testing in accordance with ICC-ES – AC-156 Acceptance Criteria for Seismic Qualification Testing of Non-Structural Components.

### **1.6 DELIVERY, STORAGE AND HANDLING**

- A. Packing Shipping Handling and Unloading: Deliver materials to the Project site in manufacturer's unopened containers, clearly indicating manufacturer's name, brand, type, style, size, color, texture and other identifying information.
- B. Storage and Protection: Store materials in a dry location, off the ground and in a manner to prevent damage, deterioration and intrusion of foreign matter. Replace materials which have been damaged or are otherwise unfit for use.

### **1.7 PROJECT/SITE CONDITIONS**

- A. Temperature And Humidity Conditions: Do not install acoustical materials unless temperature and humidity conditions closely approximate the interior conditions which will exist when the building is occupied. Maintain temperature and humidity conditions before, during, and after installation. Plastering, concrete and terrazzo work (including grinding) shall be complete and dry. Windows and doors shall be in place and glazed.
- B. Conditions Prior to Installation: Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.



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### 1.8 WARRANTY

- A. Warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and are in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.
- B. Special Warranty: Provide a written warranty, for a period of fifteen (15) years warranting Acoustic Board (Type AC\_\_\_\_\_) against warping or sagging resulting from defects of materials or factory workmanship and against the occurrence of 50% red dust. Upon notification of such defects, within the warranty period, make the necessary repairs and replacements, at the convenience of the Owner.
- C. Special Warranty: Provide a written warranty, for a period of ten (10) years warranting the suspension systems against rusting or other deficiencies resulting from defects of materials or factory workmanship. Upon notification of such defects, within the warranty period, make the necessary repairs and replacements, at the convenience of the Owner.

### 1.9 MAINTENANCE

- A. Extra Materials
  - 1. Furnish to the Owner and store at the site where directed, 2% of each type of acoustic tile and acoustic board installed in the Project, packaged in manufacturer's unopened cartons and identified as to contents.
  - 2. Furnish quantity of each exposed component of suspension systems equal to 2% of amount installed in the Project.

## PART 2 - PRODUCTS

### 2.1 ACOUSTIC PANEL AND TILE MATERIALS

- A. Acoustic Panel Ceilings
  - 1. Acoustic Board (**Type ACT-01**):
    - a. Basis of Design: Calla 2824 (Armstrong)
    - b. Surface Texture: Smooth Texture
    - c. Composition: Mineral Fiber
    - d. Color: White
    - e. Size: 24 in x 24 in
    - f. Edge Profile: Square Tegular
    - g. Noise Reduction Coefficient (NRC) ASTM C 423 Classified w/ UL label on product carton: 0.85
    - h. Ceiling Attenuation Class (CAC): ASTM E1414/E1414M; Classified with UL label on product carton: 35



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- i. Articulation Class (AC): ASTM E 1111; Classified with UL label on product carton: 170
- j. Flame Spread: ASTM E 1264; Class A
- k. Light Reflectance (LR) White Panel: ASTM E 1477; 0.85
- l. Dimensional Stability: HumiGuard Plus
- m. Recycle Content: Up to 76% total recycled content. (Total recycled content: pre-consumer, post-consumer and post-industrial)
- n. Material Ingredient Transparency: Health Product Declaration (HPD); Declare Label
- o. Life Cycle Assessment: Third Party Certified Environmental Product Declaration (EPD)
- p. Indoor Air Quality Certified to SCS-105 v4.2-2023
- q. USDA Certified Biobased Product
- r. Basis of Design:
  - 1) **Calla, 2824** as manufactured by Armstrong World Industries, Inc.
- 2. Acoustic Panel (**Type ACT-02**) – **NOT USED**
- 3. Acoustic Panel (**Type ACT-03**)
  - a. Basis of Design:
    - 1) **FELTWORKS** Open Cell Rectangles Kit (Armstrong World Industries)
  - b. Ceiling Panel:
    - 1) Surface Texture: Soft
    - 2) Composition: Non-woven layered and formed Polyester felt (PET) fiber
    - 3) Color: Mocha
  - c. Edge Profile: Square
  - d. Light Reflectance (LR) Cotton Panel: ASTM E 1477; 0.80
  - e. Material Ingredient Transparency: Health Product Declaration (HPD); Declare Label
  - f. Green Guard Gold Certified
  - g. Sizes: 653KOR12S8 96"x96"x12"
- 4. Acoustical Performance is tested per ASTM C423 and mounted in accordance with ASTM E795. NRC of 0.80 based on E-400 mounting.
- 5. Flame Spread: Class A
- 6. Dimensional Stability: HumiGuard Plus.

## **2.2 SUSPENSION SYSTEM MATERIALS**

### **A. Primary Suspension Members**

1. General: Provide ceiling support primary suspension members and components complying with ASTM C635 Classification "Heavy Duty", unless otherwise specified of suitable design and adequate strength to support the acoustic materials, light fixtures, diffusers and other items occurring in or on the ceiling.
2. Wire Hanger Inserts: No. 6 galvanized wire loop and 26 gauge (0.55mm) galvanized shell or 14 gauge (2mm) galvanized steel strap with 5/16 in. (8mm) diameter hole.
3. Strap Iron Hanger Inserts: Mild steel flats hot dip galvanized or with manufacturer's standard rust inhibiting coating, 1 in. (25mm) x 3/16 in. (5mm) with 7/16 in. (11mm) holes punched on center line and lower ends, designed to develop the full strength of hangers.
4. Strap Iron Hanger Inserts: Mild steel flats hot dip galvanized or with manufacturer's standard rust inhibiting coating, 1 in. (25mm) x 3/16 in. (5mm) x 3 in. (75mm) with 7/16 in. (11mm) diameter holes punched on center line and both ends, designed to develop the full strength of hangers and bent at 90 deg. to permit anchor bolt attachment to existing slab.
5. Hanger Anchorage Devices: Screws, clips, bolts or other devices applicable to the indicated method of structural anchorage for ceiling hangers. Provide anchorage devices sized for five (5) times the calculated load supported.
6. Hangers: Galvanized, one of the following:
  - a. 3/16 in. (5mm) x 1 in. (25mm) steel straps.
  - b. ASTM A510 (A510M); 1/4 in. (6mm) diameter mild carbon steel rods.
  - c. ASTM A641 (A641M), Class 1 zinc coating, soft temper 8 gauge (4.12mm) soft steel wire.
7. Carrying Channels: ASTM C754, cold rolled steel channels, 1-1/2 in. (38mm), 414 lbs. (188kg) per 1000 linear ft (300 linear m).
8. Clips: Provide support clips, clamps, fasteners, and other attachment devices as required to connect components and transfer imposed loads of primary suspension system.

### **B. Suspension System at ACT-01:**

1. Components: Main beams and cross tees, base metal and end detail, fabricated from commercial quality hot dipped galvanized steel complying with ASTM A 653 for Heavy Duty classification. Main beams and cross tees are double-web steel construction exposed flange design. Exposed surfaces chemically cleansed, capping prefinished galvanized steel in baked polyester paint. Main beams and cross tees shall have rotary stitching.



2. Structural Classification: ASTM C 635 Intermediate or Heavy Duty.
3. Color: White
4. Sustainability: Environmental Product Declaration (EPD)
5. Basis of Design (select one to work with specified ceiling):
  - a. Suprafine XL 9/16" Exposed Tee as manufactured by Armstrong World Industries, Inc.
6. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.
7. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft annealed, with a yield stress load of at least three times design load, but not less than 12 gauge.
8. Edge Moldings as detailed and provided by manufacturer:
  - a. AXIOM Trim & Transitions as manufactured by Armstrong World Industries, Inc. [www.armstrongceilings.com/axiom](http://www.armstrongceilings.com/axiom)
  - b. Accessories by manufacturer
- C. Suspension System at ACT-02: Not Used
- D. Suspension System at ACT-03:
  1. **Armstrong Aluminum Suspension System:**
    - a. Acceptable Product: Listed Below as manufactured by Armstrong World Industries, Inc.
    - b. Item 6655 – Blades Hanging Kit – Each kit includes 4 hanging assemblies, use on kit for each suspension

## **2.3 MISCELLANEOUS MATERIALS**

- A. Concealed Acoustical Sealant: Nondrying, nonhardening, nonskinning, nonstaining, nonbleeding, gunnable synthetic-rubber sealant, with a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), recommended for sealing interior concealed joints to reduce airborne sound transmission.
- B. Adhesive: Type manufactured expressly for the purpose, not water soluble, containing no alcohol or other ingredients that react chemically with paint, and containing no solvent having a stronger action than naphtha on oil paint: recommended by manufacturer of acoustic tile.

## **2.4 FINISHES**

- A. General: As shown for the respective units and matching the reviewed samples. Remove scratches, abrasions, dents, die markings and other defects prior to finishing operations. Perform this work in addition to finish treatment specified. Comply with NAAMM "Metal



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Finishes Manual" for finish designations and application recommendations unless otherwise specified.

### B. Aluminum Finishes

1. Organic Coating: Electrolytically applied baked-on acrylic or polyester enamel coating in colors and gloss as selected by the Architect, of minimum 0.80 mils (0.020mm) dry film thickness complying with AA-C12C42R1x applied over manufacturer's standard substrate preparation including a acid chromate fluoride phosphate conversion coating.

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. Manufacturer's Instructions: Prepare substrates and install the work of this Section, including components, and accessories in accordance with the manufacturer's instructions, except where more stringent requirements are shown or specified, and where project conditions require extra precautions or provisions to ensure satisfactory performance of the Work.

### 3.2 EXAMINATION

- A. General: Examine substrates and structural framing to which ceiling system attaches or abuts, with Installer present, for compliance with requirements specified in this and other sections that affect installation and anchorage of ceiling system. Do not proceed with installation until unsatisfactory conditions have been corrected.
  1. Review existing structure for anchorage of specified hangers. Anchor hangers to existing structural concrete or existing structural steel or provide supplemental steel members for support of system.
- B. Coordination: Coordinate layout and installation of acoustical ceiling systems with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies. Furnish layouts for preset inserts, clips, and other ceiling anchors whose installation is specified in other sections. Furnish concrete inserts and similar devices to other trades for installation well in advance of time needed for coordination of other work.

### 3.3 PREPARATION

- A. Substrate Acceptability: Commencement of installation shall constitute acceptance of substrate conditions by the Installer

### 3.4 INSTALLATION - GENERAL

- A. Verify all measurements and dimensions at the Project site and coordinate the Work with the work of other trades, with particular attention given to the work of mechanical and electrical trades.
- B. Install all materials and systems in accordance with ASTM C636 and ASTM E580 unless otherwise shown or specified.
- C. Make all exposed surfaces of acoustical units level and flush with all joints straight and

true. Neatly cut and fit units around light fixtures and around other items protruding through acoustical ceilings. Install all exposed members with flush hairline joints.

- D. Install edge moldings of type indicated at perimeter of acoustical ceiling area and at locations where necessary to conceal edges of acoustical units. Apply continuous ribbon of acoustical sealant on back of vertical leg before fastening to vertical surface. Locate so that sealant will be concealed after installation. Screw attach moldings to substrate 16 in. (400mm) o.c. maximum, and not more than 3 in. (75mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 in. (3mm) in 12 ft. (3.4m). Miter corners accurately to provide hairline joints and connect securely.
- E. Factory drill acoustic tile occurring at hidden loudspeakers and fire alarm gongs.
- F. Center tile or board pattern both directions in each major space or room as shown or directed and, where possible, adjust pattern so that edge pieces will be not less than 2 unit in width.
- G. Run grain of units in one direction, as shown or directed, and align joints in both directions unless otherwise shown.
- H. Use procedures that will minimize damage or soiling of the units during installation. Replace units which are damaged or cannot be adequately cleaned as directed.

### **3.5 INSTALLATION OF MECHANICAL SUSPENSION SYSTEM, GENERAL**

- A. Install primary suspension members and mechanical suspension system in accordance with ASTM C636 to support required loads and to prevent deflection in excess of 1/360 of the span between supports. Water or laser level accurately in both directions, leveling to a tolerance of 1/8 in. (3mm) in 12 ft. (3.4m).
- B. Seismic Bracing: Comply with ASTM E580 "Standard Practice for Application of Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels in areas requiring Seismic Restraint".
- C. Install suspension systems with hangers supported only from building structural members. Locate hangers not less than 6 in. (150mm) from each end and spaced 4 ft. (1.2m) maximum along each carrying channel or runner. Coordinate spacing of hangers, carrying channels, runners and molding with the location of electrical fixtures, sprinkler heads, and other items occurring in or on the ceiling. Splay hangers only where required to miss obstructions and offset horizontal force by bracing or other approved methods.
- D. Where ceilings are suspended below ductwork, piping or other building elements which are not suitable for ceiling attachment due to strength limitations, restrictions of local authorities having jurisdiction, or ceiling system manufacturer's limitations, provide additional supplemental framing, supports and related work as required to span beneath these elements from suitable support locations. Design supplemental framing and supports to accommodate the spans and loads to be sustained and to limit maximum deflections to the criteria specified and to finish to the lines and levels shown.

### **3.6 INSTALLATION OF ACOUSTIC BOARD, EXPOSED SYSTEM**

- A. Install board with edges resting on flanges of tees. Cut and fit board neatly against abutting surfaces and penetrations. Support edges by wall moldings.



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- B. Install hold-down clips in areas shown and in areas where required by governing regulations or for fire-resistance ratings.
- C. Attach main runners to carrying channels by means of channel clamps. Insert cross tees into main runners.
- D. Install wall moldings at intersection of suspended ceiling and vertical surfaces. Miter corners where wall moldings intersect or install corner caps.
- E. For reveal edge panels: Cut and reveal or rabbet edges of ceiling panels at border areas and vertical surfaces.
- F. Install acoustical panels in coordination with suspended system, with edges resting on flanges of main runner and cross tees. Cut and fit panels neatly against abutting surfaces. Support edges by wall moldings.

### **3.7 INSTALLATION OF ACT-03 BLADE PANELS**

- a) Install suspension system and blades in compliance with the approval of the authorities having jurisdiction, and in accordance with the manufacturer's FELTWORKS Open Cell Installation Instructions.

### **3.8 CLEANING**

- A. Clean and repair surfaces that have been stained, marred, or otherwise damaged. Comply with manufacturer's instructions for cleaning and touch-up of minor finish damage. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

### **3.9 PROTECTION**

- A. Protect acoustical ceilings during the construction period so that they will be without any indication of deterioration or damage at the time of acceptance by the Owner.

**END OF SECTION**

**SECTION 09 65 00  
RESILIENT FLOORING**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. General: Provide resilient flooring in accordance with requirements of the Contract Documents.
- B. Related Work Specified Elsewhere:
  - 1. Section 01 81 13 "Sustainable Design Requirements" for additional references, definitions, documentation requirements, action plans, meetings, and performance requirements of products and systems.

**1.2 REFERENCES**

- A. General: Comply with the applicable provisions of the references, except as modified by governing codes and the Contract Documents. Where a recommendation or suggestion occurs in the referenced standards, such recommendation or suggestion shall be considered mandatory. In the event of conflict between referenced standards, this specification or within themselves, the more stringent standard or requirement shall govern.
- B. ASTM International (ASTM): ASTM E648, "Standard Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source".

**1.3 SUBMITTALS**

- A. Product Data: Submit for Architect's action. Submit manufacturer's technical literature and specifications including installation instructions for each type of resilient flooring, resilient base and accessory.
- B. Product Data: Submit product data for liquid applied vapor barrier
- C. Shop Drawings: Submit for Architect's action. Submit shop drawings for the installation of the Work. Provide shop drawings for the following:
  - 1. Patterns and locations of each type of resilient flooring.
- D. Samples: Submit for Architect's action. Label samples to indicate product, characteristics, and location in the Work. Samples will be reviewed for color and appearance only. Furnish sufficient samples to establish the full range of colors and textures for materials exposed in the finished work. Compliance with other requirements is the responsibility of the Contractor. Submit the following:
  - 1. Resilient Tile Flooring: Full size for each type, color and size.
  - 2. Resilient Base: Each type and color, 24 in. (600mm) long.
  - 3. Accessories: One of each type; 24 in. (600mm) long.

- E. Quality Control Submittals: Submit the following for Architect's information:
1. Certifications
    - a. Document Review: Before commencing work, submit a written statement signed by the Contractor and the Applicator certifying that the Contract Documents, shop drawings and product data have been reviewed with material manufacturers' qualified technical representatives and that they agree the selected materials are proper, compatible with contiguous materials and adequate for the application shown.
    - b. Certification from an independent testing laboratory acceptable to authorities having jurisdiction that resilient flooring system specified complies with fire test performance requirements.
  2. Installer's Qualifications: Evidence of successful completion of work of similar scope to that shown and specified for this Project.
  3. Manufacturer's Qualifications: Evidence that the specified materials have been manufactured by the same source and successfully utilized for a minimum of 5 years on projects of a similar scope to that shown and specified for this Project.
- F. Closeout Submittals: Submit for Owner's documentation.
1. Maintenance Manuals: Describing the materials, and procedures for cleaning and maintaining each type of resilient flooring system and accessory.

#### **1.4 QUALITY ASSURANCE**

- A. Single-Source Responsibility: Provide each type of resilient flooring and accessories as produced by a single manufacturer, including recommended primers, adhesives, sealants, and leveling compounds.
- B. Installer Qualifications: Engage an experienced installer to perform work of this Section who has specialized in installing resilient products similar to those required for this Project and with a record of successful in-service performance.
- C. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from authorities having jurisdiction.
1. Fire Resistance Ratings: Provide materials that have been tested and comply with the following fire test performance criteria as determined by an independent testing laboratory acceptable to the authorities having jurisdiction. Tests shall include backing materials.
    - a. Resilient Flooring: A minimum radiant flux of 0.22 watts/sq. cm for the full duration of the test when tested in accordance with ASTM E648, based on the average of three replicate tests.
    - b. Resilient Base: A flame spread rating of 75 or less and a smoke developed rating of 450 or less when tested in accordance with ASTM E84.



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- D. Field Samples: When directed prior to installation, provide a field sample for each type resilient flooring and accessory in the building at areas designated. Utilize the same materials and installation methods in the samples as required for the final Work. Schedule the installation so that the sample may be examined, and necessary adjustments made, at least 1 week prior to date scheduled for commencing installation of the Work. When accepted, sample areas shall serve as the standard for materials, workmanship, and appearance for such Work throughout the project and shall remain a part of the final Work.

### 1.5 DELIVERY STORAGE, AND HANDLING

- A. Delivery and Storage: Deliver materials to job site in manufacturer's unopened containers clearly marked with manufacturer's name, brand, size, thickness, grade, color and design. Store materials per manufacturer's recommendations.

### 1.6 PROJECT/SITE CONDITIONS

- A. Temperature Requirements: Maintain temperature in spaces receiving resilient flooring at 70 deg. F. (21 deg. C.) minimum at least 48 hours before, during, and after installation; thereafter, maintain a 55 deg. F. (13 deg. C.) minimum. Store materials on flat surfaces in the areas scheduled to receive resilient flooring at least 48 hrs. prior to installation maintaining the above temperatures. Maintain proper temperature and ventilation as required for proper application and curing of adhesives.

### 1.7 MAINTENANCE

- A. Extra Materials: Furnish and deliver the following extra materials to Owner, at job site (store where directed) from same manufactured lot as materials installed, enclosed in protective packaging and labeled as to contents:
1. Tile Flooring: One unopened box of tile for each 100 boxes (or fraction thereof) of each type, color, pattern and size installed.
  2. Resilient Bases and Accessories: Not less than 10 linear feet (1m) for each 500 linear feet (15m) or fraction thereof, of each type, color, pattern, and size of resilient accessory installed.
  3. Sheet Vinyl Flooring: Not less than 5 linear yards (4.5m) x full width for each type, color and pattern installed. Provide additional material for installing seams.

## PART 2 - PRODUCTS

### 2.1 RESILIENT FLOORING MATERIALS

- A. Luxury Vinyl Flooring (LVF): Commercial Grade Luxury Vinyl Flooring, 100% virgin vinyl Class III, Type B Embossed.
1. **Resilient Flooring Type LVT-01:**
    - a. **LOFTEN Pebble Limstone LF 02**
      - 1) 6 in. (150mm) x 24 in. (600mm) x 1/8 in. (3mm) thick

## **2.2 RESILIENT BASE MATERIALS**

- A. Resilient Rubber Bases: ASTM F1861 Type TS Thermoset Vulcanized Extruded Rubber Base; Group 1 (solid), smooth finish, 0.125 in. (3mm) thick solid color throughout with ribbed back. Unless otherwise shown, provide bases 4 in. (100mm) high set-on cove type (Style B-Cove) at resilient tile floor and straight type (Style A-Straight) at carpeted areas as required; install base in minimum 10' lengths. Manufacturer's standard color(s) as selected by Architect.

### **1. Resilient Base Type RB-01: Icicle (Johnsonite)**

## **2.3 AUXILIARY MATERIALS**

- A. Resilient Tile Reducer Strip: Vinyl; 1/8 in. (3mm) thick x 1 in. (25mm) wide x length required; manufacturer's standard color(s) as selected by the Architect; one of the following:
1. "No. 633" (Burke Mercer.).
  2. "Reducer Strip No. 22" (Roppe).
  3. "No. 192A" (Flexco.).
- B. Metal Edge Strips: Extruded aluminum alloy of standard design and finish, height required to protect edge of resilient flooring; maximum lengths to minimize joints; concealed anchorage type unless otherwise shown.
- C. Leveling and Patching Compounds: Type as recommended by flooring manufacturer. Do not use gypsum based leveling or patching compounds.
- D. Adhesive for Resilient Flooring: Type recommended by resilient flooring manufacturer and best suited for the purpose. Water-resistant type recommended in writing by manufacturer for substrate and conditions indicated.

### **1. LEVEL FLOOR TO FF75/FL50 PRIOR TO SETTING LVF**

- E. Cement for Resilient Bases: Waterproof type as recommended by base manufacturer.
- F. Primer: Non-staining type as recommended by resilient flooring manufacturer.
- G. Wax: FS P-W-155, 16% concentration; slip-resistant, water emulsion base.
- H. Sealers: Type as recommended by manufacturer as compatible with resilient tile and adhesive.
- I. Liquid Applied Vapor Barrier:
1. Vapor Ban E (Laticrete)

## **PART 3 - EXECUTION**

### **3.1 GENERAL**

- A. Manufacturer's Instructions: Prepare substrates, apply primers and install the work of this



Section, including components and accessories in accordance with the manufacturer's instructions, except where more stringent requirements are shown or specified, and where project conditions require extra precautions or provisions to ensure satisfactory performance of the Work.

### 3.2 EXAMINATION

- A. Verification of Conditions: Examine the areas to receive the Work and the conditions under which the Work would be performed. Remedy conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected..

### 3.3 PREPARATION

- A. Substrate Acceptability: Commencement of installation shall constitute acceptance of substrate conditions by the Installer.
- B. Install resilient flooring and accessories after other finishing operations, including painting, have been completed. Do not install resilient flooring over concrete slabs until the latter have been cured and are sufficiently dry to achieve bond with adhesive as determined by resilient flooring manufacturer's bond and moisture test. If floor does not meet recommended moisture requirements, seal floor with compatible materials.
- C. Clean substrate to remove deleterious substances which would impair the work. Remove coatings from subfloor surfaces that would prevent adhesive bond, including curing compounds incompatible with resilient flooring adhesives, paint, oils, waxes and sealers.
- D. Prepare concrete floors in accordance with ASTM F710. Use leveling and patching compounds for filling cracks, holes and depressions in the substrate. Surface shall be smooth, level and at proper elevation. Surface shall not vary more than 1/8 in. (3mm) in 10 ft. (3m) in any direction from level, plumb or slopes shown. Remove roughness and protrusions from concrete surfaces by grinding. Broom clean or vacuum surfaces to be covered, and re-inspect subfloor. Test concrete floors to ensure that they are fully cured and dry before installation of resilient flooring, in accordance with applicable provisions of RTI and RMA.
  - 1. Moisture vapor transmission shall not exceed 3 lbs/1000ft.<sup>2</sup> per 24 hours in compliance with ASTM F1869 and that relative humidity within concrete slab shall not exceed 75% as per ASTM F2170.

### 3.4 INSTALLATION, GENERAL

- A. Typically applied liquid vapor barrier: Apply vapor barrier system per manufacturer's recommendations.
- B. Prime Coat: Apply primer to concrete surfaces; work well into surface; use minimum quantity that will assure complete surface coverage with a non-absorptive base. Allow primer to dry before applying adhesive. Prime coat may be omitted if recommended by resilient flooring manufacturer.
- C. Adhesive: Apply to substrate with properly notched steel trowels; allow adhesive to become tacky before applying resilient flooring.
- D. Extend resilient flooring into closets, offsets and under movable equipment of the rooms

and spaces scheduled to receive resilient flooring, including recessed covers within those spaces. Extend unexposed edges of flooring under set-on bases and similar trim work. Scribe, cut and fit exposed edges of flooring and base adjoining other work accurately and neatly with a tight joint. Tightly cement resilient flooring to substrate without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections. Hand roll resilient flooring at perimeter of each covered area to assure adhesion.

- E. Install resilient flooring on covers for telephone and electrical ducts, and other such items occurring within finished floor areas. Maintain overall continuity of color and pattern with pieces of flooring installed in these covers. Tightly cement edges to perimeter of floor around covers and to covers.

### **3.5 INSTALLATION, RESILIENT TILE**

- A. Layout: Lay tile units symmetrically about center line of major room or space in a square pattern, unless otherwise shown; adjust so edge units are not less than 1/2 of tile width.
- B. Match 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.
- C. Installation: Lay tile units with bottom surface securely bonded to substrate and top surface left smooth, clean and free from imperfections. Fit tiles tightly so each unit is in contact with contiguous tiles and joints are in proper alignment. Scribe, cut, and fit tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, edgings, door frames, thresholds, and nosings.
- D. Adhere tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections. Make neat tight joints where exposed edges abut other surfaces. Lay tile with graining running in one direction as directed, unless otherwise shown. Align joints both directions in a square pattern unless otherwise shown.

### **3.6 RESILIENT WALL BASE INSTALLATION**

- A. Acclimate resilient base to room temperature for a minimum of 24 hours prior to installation. Apply resilient base to walls, columns, pilasters, casework and other permanent fixtures in rooms or areas where base is required. Install base with preformed corner units, or fabricated from base materials with mitered or coped inside corners.
- B. Secure bases to surfaces with waterproof cement; make joints tight; keep top and bottom edges in firm contact with base in continuous contact with horizontal and vertical substrates and adjacent surfaces. Install in longest single lengths for each location where possible without gaps at seams and with tops of adjacent pieces aligned. Do not stretch base during installation.
- C. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.
- D. Premolded Corners: Install premolded corners before installing straight pieces.
- E. Job-Formed Corners

1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends). Shave back of base at points where bends occur and remove strips perpendicular to length of base that are only deep enough to produce a snug fit without removing more than half the wall base thickness.
2. Inside Corners: Use straight pieces of maximum lengths possible. Form by cutting an inverted V-shaped notch in toe of wall base at the point where corner is formed. Shave back of base where necessary to produce a snug fit to substrate.

### **3.7 RESILIENT ACCESSORY INSTALLATION**

- A. Reducer Strips: Install resilient reducer strips in continuous lengths at exposed edges of resilient flooring, tightly butted to flooring and secure with adhesive. Install strips at edges of flooring which would otherwise be exposed.
- B. Metal Edge Strips: Install in continuous lengths at exposed edges of resilient flooring, and anchor strips solidly to substrate with countersunk nonmagnetic stainless steel screws; use lead shields for anchoring into concrete; space screws 1 in. (25mm) from each end and not more than 9 in. (225mm) centers at intermediate points. Install strips before applying primer or adhesive. Install strips at edges of flooring which would otherwise be exposed.

### **3.8 CLEANING**

- A. Cleaning: Remove adhesive and other blemishes from exposed surfaces.
- B. Do not wash floor until time period has elapsed to allow resilient flooring to become well-sealed in adhesive. Clean floor thoroughly not more than 4 days before acceptance or occupancy by the Owner, clean the resilient flooring and base.
- C. Waxing: In accordance with manufacturer's instructions and as soon as the resilient flooring is completely dry after cleaning, apply a heavy coat of floor wax and buff thoroughly with mechanical buffers .

### **3.9 PROTECTION**

- A. Protect work from damage and from normal wear and tear throughout construction period so that it will be without indication of use or damage at the time of acceptance by the Owner.
- B. Utilize plywood or hardboard covering to protect flooring from rolling load damage by carts or dollies used to move stationary equipment or furnishings across floors.
- C. Cover resilient flooring with undyed, untreated building paper until inspection for substantial completion.

**END OF SECTION**

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CARPETING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Provide carpeting in accordance with requirements of the Contract Documents.
- B. Related Requirements:
  - 1. Section 01 81 13 "Sustainable Design Requirements" for additional references, definitions, documentation requirements, action plans, meetings, and performance requirements of products and systems.
  - 2. Section 09 65 00 "Resilient Flooring" for resilient wall base and accessories installed with carpet.
  - 3. Div 26 for interface with in floor electrical components.

**1.2 REFERENCES**

- A. General: Comply with the applicable provisions of the referenced standards except as modified by governing codes and the Contract Documents. Where a recommendation or suggestion occurs in the referenced standards, such recommendation or suggestion shall be considered mandatory. In the event of a conflict between referenced standards, this specification or within themselves, the more stringent standard or requirement shall govern.
- B. Carpet and Rug Institute (CRI)
  - 1. "The Carpet Primer".
  - 2. "CRI Carpet Installation Standard" excluding references not specified herein.
- C. Carpet Cushion Council (CCC): "Commercial Carpet Cushion Guidelines".
- D. ASTM International (ASTM)
  - 1. ASTM D2859, "Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials".
  - 2. ASTM E648, "Standard Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source".
  - 3. ASTM F710, "Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring".
- E. Consumer Product Safety Commission (CPSC): CPSC 16 CFR, Part 1630, "Standard for the Surface Flammability of Carpets and Rugs".

### 1.3 DEFINITIONS

- A. Definitions: Refer to "CRI Carpet Installation Standard" for definitions.

### 1.4 SYSTEM DESCRIPTION

- A. Performance Requirements

1. Fire Resistance Ratings: Carpeting when used without cushion, and carpet and carpet cushion tested as an assembly shall comply with the following performance requirements:
  - a. CPSC 16 CFR, Part 1630 with a passing rating (DOC FF 1-70 or ASTM D2859, Methenamine Pill Test).
2. Appearance Retention Rating: Severe
3. Dry Breaking Strength: Not less than 100 lbf (445 N) according to ASTM D2646.
4. Tuft Bind: Not less than 5 lbf (22 N) according to ASTM D1335.
5. Delamination: Not less than 4 lbf/in. (0.7 N/mm according to ASTM D 3936.
6. Dimensional Tolerance: Within 1/32 inch (0.8 mm) of specified size dimensions, as determined by physical measurement.
7. Dimensional Stability: 0.1 percent or less according to ISO 2551 (Aachen Test).
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 3.0 kV according to AATCC 134.

Provide carpeting that complies 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

11. All synthetic carpeting (including face fiber, primary backing, and secondary backing) must have carpet component identification code labels as established by the Carpet and Rug Institute (CRI) of Dalton, Georgia as per the Green Building Tax Credit requirements. The labels must be permanently printed or attached to the carpet backing. The codes must identify the carpet's face fiber, and may identify its primary backing, secondary backing, adhesive, adhesive filler, and dyes.
12. Carpet cushion shall surpass all criteria of the "Green Label" Indoor Air Quality testing program established by the Carpet and Rug Institute (CRI) of Dalton, GA.



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Synthetic carpet cushion must meet or exceed the recycled contents content requirements and product specifications as available, listed in the U.S. Environmental Protection Agency's Comprehensive Procurement Guideline for Products Containing Recovered Materials.

13. Carpets and accessories shall not contain polyvinyl chlorides.

**1.5 SUBMITTALS**

- A. **Product Data:** Submit for Architect's action. Submit manufacturer's printed technical literature, specifications and installation instructions describing the general properties of each material and accessory to be used in the Work and other data as may be required to show compliance with the Contract Documents including written data on physical characteristics, durability, resistance to fading, and flame resistance characteristics.
- B. **Shop Drawings:** Submit for Architect's action. Submit shop drawings showing carpeting layout, start points, seam locations, cushion type and edge strip types and locations. Include on shop drawings dimensions which verify field conditions and information as to type of subfloor. Indicate direction of pattern and lay of pile. Show details of cutouts. Indicate columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpeting. Indicate transition details to other flooring materials and type, color, and location of edge, transition, and other accessory strips. In addition, submit the following:
  1. **Carpeting Schedule:** As part of shop drawing submittal, submit a complete schedule of carpeting utilizing same room and product designations shown. Indicate type of installation for each carpet type.
  2. Provide information as to which areas require a total glue down installation for carpet tiles.
  3. Identify Locations of in floor electrical components and connect track edge ramps.
- C. **Samples:** Submit for Architect's action. Label samples to indicate product, characteristics, and location in the Work. Samples will be reviewed for color and appearance only. Furnish sufficient samples to establish the full range of colors and textures for materials exposed in the finished work. Compliance with other requirements is the responsibility of the Contractor. Where piece dyed, submit sample from actual dye lot for approval prior to shipping finish carpeting to the site. Prepare samples from same material to be used for the Work. Provide the following:
  1. **Carpet Tile:** Full size of each type, color and pattern with backer.
  2. **Carpet Edge Strip:** 6 in. (150mm) long sample of each type and color.
- D. **Quality Control Submittals:** Submit for Architect's information.
  1. **Quality Control Testing and Inspection Reports:**

- a. Certified laboratory test reports for fire hazard classification of carpet and carpet cushion showing compliance with specified fire hazard ratings, from an independent testing laboratory.
- 2. Certificates
  - a. Document Review: Before commencing work, submit a written statement signed by the Contractor and the Installer certifying that the Contract Documents, shop drawings and product data have been reviewed with material manufacturers' qualified technical representatives and that they agree the selected materials are proper, compatible with contiguous materials and adequate for the application shown.
- 3. Installer's Qualifications: Evidence of successful completion of work of similar scope to that shown and specified for this Project.
- E. Closeout Submittals: Submit for Owner's documentation.
  - 1. Warranties: Special warranties as specified.
  - 2. Maintenance Manuals: Submit bound maintenance manuals, describing the materials and procedures for care, cleaning and maintaining each type of carpeting and accessory. Submit the following:
    - a. Manufacturer's recommended frequency for maintaining carpeting.
    - b. Precautions for cleaning materials and methods that could be detrimental to finishes and performance. Include cleaning and stain-removal products and procedures.
  - 3. Recycling Instructions: Submit written instructions describing all aspects of post-consumer recycling programs for carpet uplifted for replacement and for carpet to be installed.

## **1.6 QUALITY ASSURANCE**

- A. Qualified Installer: The carpeting work shall be performed by an installer having five (5) years experience in the installation of carpeting materials on projects similar in size and scope to this Project. Installer shall be certified by the International Certified Floorcovering Installers Association at the [Commercial II][Master II] certification level.
- B. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of authorities having jurisdiction. Obtain necessary approvals from all such authorities.
- C. Production Samples: At beginning of carpeting production, provide one (1) yd<sup>2</sup> (m<sup>2</sup>) of each first production run for verification of specified products.
- D. Field Samples: Prior to the Pre-Installation Conference, provide a field sample for each type carpet in the building at areas to be designated by the Architect. Utilize the same materials and installation methods in the sample as required for the final Work. Schedule the installation so that the sample may be examined, and any necessary adjustments made, at least 1 week prior to date scheduled for commencing installation of the Work.

When accepted, sample areas shall serve as the standard for materials, workmanship, and appearance for such Work throughout the project and shall remain a part of the final Work.

1. Adhesive Test Sample: Remove adhesive-installed carpet from sample area, while Owner's personnel are present, to demonstrate removal procedures that will minimize damage to carpet and floor.
- E. Benchmarks: Build benchmarks to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
  1. Approval of benchmarks does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  2. Subject to compliance with requirements, approved benchmarks may become part of the completed Work if undisturbed at time of Substantial Completion.

#### **1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Packing, Shipping, Handling and Unloading: Deliver carpet in original mill protective wrapping with mill register numbers and tags attached. Comply with CRI Carpet Installation Standard Section 5.2 for handling requirements. Deliver other materials in manufacturer's unopened containers identified with name, brand type, grade, class and other qualifying information.
- B. Storage and Protection: Store materials in a dry location, in such a manner as to prevent damage. Comply with CRI Carpet Installation Standard Section 5.1 for storage requirements. Follow manufacturer's recommendations for minimum temperatures to which adhesives are exposed.

#### **1.8 FIELD / SITE CONDITIONS**

- A. Ambient Conditions: Comply with CRI Carpet Installation Standard, Section 7.2, "Ambient Temperature and Humidity." Do not install carpet until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Substrate Requirements: Do not install carpeting over concrete substrate until concrete has cured and is sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet manufacturer.

#### **1.9 WARRANTY**

- A. General: Warranties and guaranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and are in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.
- B. Special Warranty: Submit for Owner's documentation. Furnish 10 year written warranty in form stipulated by Architect, signed by the Contractor and Subcontractor, addressed to the Owner and assignable to all future Owners within this warranty period, agreeing to



repair or replace Work which has failed as a result of defects in materials or workmanship. Failure shall include excessive wear (no more than 10% face fiber loss), fading, tearing, cracking, separation, secondary back delamination, deterioration, loosening or delamination from substrate (for glue-down method, delamination will not occur without use of chair cushions), seam failure, ripples, scallops, pilling or puckering. Upon notification of such defects, within the warranty period, make necessary repairs or replacement at the convenience of the Owner. Other guarantees or warranties may not be substituted by the Contractor for the terms of this special warranty.

## **PART 2 - PRODUCTS**

### **2.1 CARPET MATERIALS**

- A. Carpet Fibers: Types as scheduled and as recommended by the carpet manufacturer for the conditions of installation and use.
  - 1. All yarn and carpet shall be 100% recyclable. Avoid mixed fiber types to facilitate future recycling.
- B. Pile Yarn: Provide yarn spun in the manner recommended by the yarn manufacturer and the carpet manufacturer, in number of plies and denier indicated or required, to achieve the pile yarn weight, texture and pattern indicated.
- C. Dye: Use solution dyes and dyeing methods recognized by the industry as successful for the type of fiber being dyed and to achieve the required colors and fade resistance. Achieve the fade resistance established by the Association of Textile Chemists and Colorists for carpet when tested on the Atlas Fadeometer for 40 hours.

### **2.3 CARPET SCHEDULE**

- A. Carpet Designation [**CPT-01**]:
  - 1. Manufacturer: Interface
  - 2. Manufacturer's No.: 1380102500
  - 3. Manufacturer's Product Name: Cubic 004287 Shape
  - 4. Size: 19.69" x 19.69" (50cm x 50cm)
  - 5. Color: 004287 Shape
  - 6. Construction: Tufted Textured Loop
  - 7. Pile:
  - 8. Face Yarn Content: 100% Recycled Nylon
  - 9. Dye System: 100% Solution Dyed
  - 10. Tufted Yarn Weight: 18 oz/sq yd



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11. Machine Gauge: 1/12"
12. Pile Height: .14" (3.6mm)
13. Total Height:
14. Backing Construction:
  - a. GlasBac
15. Stitches per In.: 8.16/in
16. Pile Density 6,968 oz/cu yd
17. Applied Treatments:
  - a. Soil-Resistance Treatment: Protekt2
  - b. Anti-Microbial Treatment: Intersept
18. Method of Installation: Non Directional, Quarter Turn

**B. Carpet Designation [CPT-02]:**

1. Manufacturer: Interface
2. Manufacturer's No.: 138010250F
3. Manufacturer's Product Name: Cubic 004287 Shape
4. Size: 19.69" x 19.69" (50cm x 50cm)
5. Color: 004287 Shape
6. Construction: Tufted Textured Loop
7. Pile:
8. Face Yarn Content: 100% Recycled Nylon
9. Dye System: 100% Solution Dyed
10. Tufted Yarn Weight: 18 oz/sq yd
11. Machine Gauge: 1/12"
12. Pile Height: .14" (3.6mm)
13. Total Height:
14. Backing Construction:



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- a. CushionBac Renew
- 15. Stitches per In.: 8.16/in
- 16. Pile Density 6,968 oz/cu yd
- 17. Applied Treatments:
  - a. Soil-Resistance Treatment: Protekt2
  - b. Anti-Microbial Treatment: Intersept
- 18. Method of Installation: Non-Directional, Quarter Turn

**2.4 AUXILIARY MATERIALS**

- A. Tack Strip: Water-resistant 3-ply beveled edged plywood in strips, thickness to match cushion thickness, suitable for commercial installations and in compliance with CRI Carpet Installation Standard Section 16.2, with 2 rows or 3 rows of angular pins protruding from the top designed to grip and hold stretched carpet at backing. Provide "1 inch Tack Strip" (Roberts Consolidated /Q.E.P. Co., Inc.) or equal, type as required for installation shown.
- B. Adhesives:
  - 1. Carpet Adhesive: Water and mildew-resistant and nonstaining, release-type as recommended by the carpet manufacturer to comply with flammability requirements for installed carpet. Comply with CRI Green Label Certification Program.
  - 2. Cushion Adhesive: Release-type, mildew resistant as recommended by the cushion manufacturer to comply with flammability requirements for installed carpet and cushion and expressly produced for use with specified carpet cushion on substrate. Comply with CRI Green Label Certification Program.
- C. Metal Edge Strip: Anodized aluminum strip with fold down edge and concealed carpet gripper teeth, minimum 1-1/2 in. (38mm) wide punched anchorage flange and minimum 5/8 in. (16mm) wide fold flange. Provide "Carpet Gripper" (M-D Building Products, Inc.) or equal.
- D. Rubber Edge Strip: Extruded or molded heavy duty rubber, of sizes, shapes and height as best suited for the respective purposes intended; colors as selected by Architect from the manufacturer's standard color range; Provide edge strips from one of the following manufacturers:
  - 1. Burke Mercer Floor Products
  - 2. Roppe Rubber Corp.
  - 3. Johnsonite.
  - 4. Flexco.

- E. Anti-Static Fiber: Metallic carpet fiber; of non-corrosive metal; of sufficient flexibility and low denier as to be unnoticeable when blended with carpet fiber; effective in controlling static build-up to 3000 volts with ambient conditions of 15% relative humidity and 72 deg. F. (22 deg. C.) in persons with oak-tanned leather soled shoes.
- F. Anti-Static Spray: "Anti-Static Spray" (Chemspec) or equal.
- G. Primary Backing, Secondary Backing and Back Coating: As recommended by the carpet manufacturer for the conditions of installation and use.
- H. Seaming Tape: Hot-melt adhesive tape specifically manufactured for taping seams and butting cut edges at backing to form secure seams and to prevent pile loss at seams. Provide "Power-Loc Heat Bond Tape No. 50-375" (Roberts Consolidated/Q.E.P. Co., Inc.) or equal.
- I. Leveling and Patching Compounds: Type recommended by carpet and/or cushion manufacturer. Do not use gypsum based compounds.
  - 1. K-15 (Ardex)
  - 2. 547 (Henry's)
  - 3. S-184 (Armstrong)
- J. Liquid Applied Vapor Barrier:
  - 1. Vapor Ban E (Laticrete)
  - 2. Roll Cote (Bostik)
- K. All Other Materials: Manufacturer's standard for the product specified.

## **2.5 CARPET CONSTRUCTION**

- A. Fabricate the carpet by construction methods indicated in the schedule by manufacturer's standard process which is recognized by the carpet industry for that method.

## **PART 3 - EXECUTION**

### **3.2 GENERAL**

- A. Manufacturer's Instructions: Prepare substrates and install the work of this Section, including components, and accessories in accordance with the manufacturer's instructions, except where more stringent requirements are shown or specified, and where project conditions require extra precautions or provisions to ensure satisfactory performance of the Work.

### **3.3 EXAMINATION**

- A. Verification of Conditions: Examine the areas to receive the Work and the conditions under which the Work would be performed. Remedy conditions detrimental to the proper

and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

- B. Verify recommended limits for moisture content and alkalinity of concrete substrate with carpet and cushion manufacturer(s).

### **3.4 PREPARATION**

- A. Coordination: Coordinate the installation of carpet so as not to delay the occupancy of the building or interfere with the completion of construction.
- B. Substrate Acceptability: Commencement of installation shall constitute acceptance of substrate conditions by the Installer.
- C. Use cementitious leveling and patching compounds compatible with and as recommended by carpet manufacturer for filling cracks, holes and depressions in the substrate. Surface shall be smooth, level and at proper elevation. Remove roughness and protrusions from concrete surfaces by grinding. Fill or level cracks, holes and depressions 1/8 inch (3 mm) wide or wider, and protrusions more than 1/32 inch (0.8 mm) unless more stringent requirements are required by manufacturer's written instructions.
- D. Block out areas to receive under carpet electrical components including edge ramps.
- E. Patch and level floor to FF50/FL35. Abrade the surface using 100 grit sand paper to a minimum depth of 1/32" but no more than 1/8".
- F. Substrate Preparation: Verify that concrete slabs comply with ASTM F710 with an alkalinity not exceeding pH of 9, and that slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits. Comply with CRI Carpet Installation Standard Section 7.3 and 7.4 and manufacturer's recommendations for preparation requirements as related to concrete substrates.
- G. Use cementitious leveling and patching compounds compatible with and as recommended by carpet manufacturer for filling cracks, holes and depressions in the substrate. Surface shall be smooth, level and at proper elevation. Remove roughness and protrusions from concrete surfaces by grinding. Fill or level cracks, holes and depressions 1/8 inch (3 mm) wide or wider, and protrusions more than 1/32 inch (0.8 mm) unless more stringent requirements are required by manufacturer's written instructions.
- H. Apply liquid vapor barrier and allow sufficient time to cure. Test flooring after cure.
  - 1. Dryness and Suitability of Substrates: Test concrete substrates as follows. Perform one test per 1000 sq. ft. but no fewer than three tests in each installation area, with test areas evenly spaced.
    - a. Moisture vapor transmission shall not exceed 3 lbs/1000ft.<sup>2</sup> (1.4kg/93m<sup>2</sup>) per 24 hours in compliance with ASTM F1869.

- b. Relative humidity within concrete slab shall not exceed 75% as per ASTM F2170.
  - c. Perform additional moisture tests recommended in writing by adhesive and carpet tile manufacturers. Proceed with installation only after substrates pass testing.
- I. Clear away debris, broom clean or vacuum surfaces to be covered, and inspect subfloor.

### **3.5 INSTALLATION, GENERAL**

- A. Place seams at locations indicated on accepted shop drawings. Maintain direction of pattern, texture and lay of pile. Unless otherwise shown or specified, center pattern in both directions for each space or area and adjust to minimize cutting. Extend carpet into closets, alcoves and offsets, and under movable equipment movable flanges and furnishings of the rooms and spaces shown or scheduled to receive carpet, including recessed covers within those spaces.
- B. Provide cutouts as required for removable access covers in substrates except do not cutout for floor closer cover plates. Bind edges neatly where not concealed by protective edge guards or overlapping flanges, secure to substrate and maintain close tolerances so that edges of carpet will be covered by plates and escutcheons. Cut only 3 sides wherever it is feasible to provide carpet flap in lieu of fully removable cutout.
- C. At doorways, center seams under door in closed position; do not place seams perpendicular to door frame in direction of traffic through doorway. Do not bridge building expansion joints with continuous carpet.
- D. Cut openings in carpet for electrical outlets, piping and other penetrations. Maintain close tolerances so that edges of carpet will be covered by plates and escutcheons. Bind or seal cut edges as recommended by carpet manufacturer. Uniformly lay carpet onto substrate without pucker, ripples, warp or other irregularities. Roll carpet uniformly, removing air pockets or bubbles.
- E. Install edge strip at every location where edge of carpet is exposed to traffic, unless otherwise indicated. Install in single lengths wherever possible, secured in accordance with manufacturer's directions.
- F. Maintain dye-lot integrity. Do not mix dye lots in same area.

### **3.6 DIRECT GLUE-DOWN CARPET INSTALLATION**

- A. Comply with CRI Carpet Installation Standard, Section 13 "Direct Glue-Down Installation" and as follows:
  - 1. Install a test sample to demonstrate proper adhesion and removal capability of bonding system. Cut and fit sections of carpet prior to application of adhesive. Apply adhesive complying with procedure demonstrated to be satisfactory by test sample.
  - 2. Butt carpet seams and edges tightly together and cement edges of backing together with continuous bead of latex cement in accordance with manufacturer's

directions. Eliminate air pockets and roll to ensure uniform bond over the entire area. Promptly remove adhesive from carpet face.

### **3.7 MODULAR CARPET INSTALLATION**

- A. Comply with CRI Carpet Installation Standard, Section 18 "Modular Carpet" and as follows:
  - 1. Install a test sample to demonstrate proper adhesion and removal capability of bonding system. Cut and dry-fit sections of carpet prior to application of adhesive. Apply adhesive complying with procedure demonstrated to be satisfactory by test sample.
  - 2. Butt carpet tightly together to form seams without gaps and align adjoining tiles. Ensure uniform bond over the entire area. Lay carpet tiles with texture running in one direction. Adhere perimeter tiles and partial tiles with a full spread of adhesive. Dry-fit cut tiles and apply adhesive to tile back after tile has been cut. In corridor areas, use full tiles down the center and cut perimeter tile borders. In traffic areas use a total glue-down method and not perimeter bond method. In non-traffic areas use a perimeter bond method unless otherwise shown. Promptly remove adhesive from carpet face.
  - 3. Quarter turn tiles sequentially 90 degrees

### **3.8 CLEANING**

- A. Vacuum carpet with a commercial vacuum, with rotating agitator or beater in the nozzle. Remove soil spots, excess adhesive, stains and other defects using materials and methods that will not damage remainder of carpet.
- B. Remove and dispose of debris, unusable scraps and other permanently damaged, soiled or stained carpeting. Retain or dispose of scraps in accordance with manufacturer's environmental program.

### **3.9 PROTECTION**

- A. Protect carpet from damage and soiling. Use non-staining cover material for protection. Tape joints in protective covering. Comply with CRI Carpet Installation Standard, Section 20 "Protecting Indoor Installations."

### **3.10 ADJUSTING**

- A. Upon completion of the Work repair surfaces that have been permanently stained, marred, or otherwise damaged. Replace Work which is damaged or cannot be adequately cleaned as directed. Removal of carpet to be replaced, if applicable, should be handled according to pre-approved plan for recycling.

### **3.11 MAINTENANCE**

- A. Maintenance and Operating Manuals: Furnish complete manuals describing the materials, devices and procedures to be followed in cleaning and maintaining the Work. Include manufacturers' brochures describing the actual materials used in the Work, including finishes and other major components. Assemble manuals for component parts into single binders identified for each system.



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- B. Extra Materials: Deliver unused carpet and large scraps (over 2 ft<sup>2</sup> (0.18m<sup>2</sup>) in area and over 12 in. (300mm) wide) to the Owner. Store where directed on the Site.
- C. Extra Stock
  - 1. Provide extra stock equal to 5% of each carpet type specified packaged in manufacturer's original packaging, labeled as to contents. Store where directed by Owner.

**END OF SECTION**



**SECTION 09 91 00  
PAINTING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. General: Provide painting in accordance with requirements of the Contract Documents.
  - 1. Examine the requirements of the other technical Sections as to the location, extent and nature of painting work specified therein and include such items to be painted under this Section as are not included in the other Sections.
  - 2. In general, paint exposed surfaces except surfaces noted as pre-finished or not to be painted. Where items or surfaces are not specifically mentioned, paint the same as adjacent materials or areas. Specifically, "Paint" includes substrate preparation, coating systems materials, primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate, or finish coats.
- B. Related Work Specified Elsewhere:
  - 1. Section 01 81 13 "Sustainable Design Requirements" for additional references, definitions, documentation requirements, action plans, meetings, and performance requirements of products and systems.

**1.2 REFERENCES**

- A. General: Comply with the applicable provisions of the referenced standards except as modified by governing codes and the Contract Documents. Where a recommendation or suggestion occurs in the referenced standards, such recommendation or suggestion shall be considered mandatory. In the event of conflict between referenced standards, this specification or within themselves, the more stringent standard or requirement shall govern.
- B. ASTM International (ASTM):
  - 1. ASTM D4261 "Practice for Surface Cleaning Unit Masonry for Coating".
  - 2. ASTM D523: "Test Method for Specular Gloss".
- C. Code of Federal Regulations: "40 CFR 59, Subpart D-2002: National Volatile Organic Compound Emission Standards for Architectural Coatings".
- D. California Green Building Standards Code (CALGreen).
- E. South Coast Air Quality Management District (SCAQMD) Rule 1113.
- F. The Painting and Decorating Contractors of America (PDCA): PDCA "Specification Manual".
- G. The Society for Protective Coatings (SSPC)
  - 1. SSPC Volume 1 "Good Painting Practice".

2. SSPC Volume 2 "Systems and Specifications".

### **1.3 DEFINITIONS**

- A. General: Standard Coating Terms and Specular Gloss Range: Standard coating terms and gloss ranges in accordance with ASTM D523 "Test Method for Specular Gloss" are defined as follows:
  1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
  2. Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
  3. Semigloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
  4. Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.

### **1.4 SUBMITTALS**

- A. Product Data: Submit for Architect's action. Submit manufacturer's data for each paint system specified, including block fillers and primers indicating product information correlated to specified requirements. Provide the manufacturer's technical information including label analysis and instructions for handling, storage, and application of each material proposed for use. List each material and cross-reference the specific coating, finish system, and application. Identify each material by either the actual formula or the manufacturer's catalog and/or code number and general classification as suitable for duplication and replacement purposes.
- B. Samples: Submit for Architect's action. Label samples to indicate product, characteristics, and location in the Work. Samples will be reviewed for color and appearance only. Furnish sufficient samples to establish the full range of colors and textures for materials exposed in the finished work. Compliance with other requirements is the responsibility of the Contractor. Provide two (2) 12 in. (300mm) x 12 in. (300mm) samples on hardboard substrate, for each color, sheen and texture duplicated to simulate final conditions. Show various stages of finish on displays.
- C. Detailed Painting Schedule: Submit for Architect's information. Prepare a "Detailed Painting Schedule" on the basis of the surfaces, types of paint materials, number of coats required, and list the brand name of the product of the manufacturer proposed for each use. Use same designations indicated on Drawings and in schedules. Indicate each material and cross-reference specific coating, finish system, and application with identification related by manufacturer's catalog number and general classification.
- D. Quality Control Submittals: Submit for Architect's information.
  1. Certificates
    - a. Document Review: Before commencing work, submit a written statement signed by the Contractor and the Applicator certifying that the Contract Documents, shop drawings and product data have been reviewed with

material manufacturers' qualified technical representatives and that they agree the selected materials are proper, compatible with contiguous materials and adequate for the application shown.

- b. Certification signed by manufacturer of intumescent paint components certifying that their products comply with specified requirements, has been tested and certified by UL and meets the specified requirements.
- 2. Applicator's Qualifications: Evidence of successful completion of work of similar scope to that shown and specified for this Project.
- 3. Manufacturer's Qualifications: Evidence that the specified materials have been manufactured by the same source and successfully utilized for a minimum of 5 years on projects of a similar scope to that shown and specified for this Project.
- E. Maintenance: Submit for Owner's documentation.
  - 1. Color Formula List: Submit a list of each finish color and paint system type for coatings applied on exposed surfaces in the Work. Identify each color either by the actual formula or by manufacturer's code number, as suitable for duplication and replacement purposes.

## **1.5 QUALITY ASSURANCE**

- A. Qualified Applicator: Provide painting Work from an experienced applicator that has specialized in such Work for at least 5 years, who is experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance, and who shall have undivided responsibility for the Work.
- B. Paint Manufacturer Single-Source Responsibility: Provide primers, fillers and undercoat paint produced by the same manufacturer as the finish coats.
  - 1. Material Quality: Provide the manufacturer's best quality trade sale paint material of the various coating types specified. Paint material containers not displaying manufacturer's product identification will not be acceptable. Proprietary names used to designate colors or materials are not intended to imply that products named are required or to exclude equal products of other manufacturers.
- C. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction, including VOC requirements for applicable Air Quality District. Obtain necessary approvals from authorities having jurisdiction.
- D. Mock-Up(s) (Benchmark Samples)
  - 1. Provide mock-up(s) consisting of full-coat benchmark finishes for each type of coating and substrate required after approval of paint samples, totaling approximately 100 ft.<sup>2</sup> (9m<sup>2</sup>) each in spaces designated by the Architect for final review. Duplicate finish of approved sample Submittals.
  - 2. Apply benchmark finishes, according to requirements for the completed Work, after permanent lighting and other environmental services have been activated. Provide required sheen, color, and texture on each surface. After finishes are

accepted, Architect will use the room or surface to evaluate coating systems of a similar nature.

## **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Packing, Shipping, Handling and Unloading: Deliver paint materials to the job site in original containers and packages, bearing the manufacturer's labels, indicating name, type, brand, color name and number, application instructions, contents by volume, for pigment, vehicle and volatile constituents. Unless otherwise directed, deliver paints ready-mixed. Order in advance in large enough quantities and in ample time to facilitate the Work.
- B. Storage and Protection: Store materials and equipment in a designated storage space on the site. Protect paint and associated materials from freezing. Keep storage space neat, clean and accessible at all times. Protect floors from paint spillage. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

## **1.7 PROJECT/SITE CONDITIONS**

- A. Requirements
  - 1. Do not paint when the air is dust-laden nor when weather and temperature conditions are unsuitable. Maintain temperatures within the building at a minimum of 60 deg. F. (16 deg. C.) during the painting and drying periods.
  - 2. Apply paint only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 deg. F. (10 deg. C.) and 90 deg. F. (32 deg. C.). Comply with manufacturer's recommendation when they are more stringent with respect to application temperatures.
  - 3. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85%; or at temperatures less than 5 deg. above the dew point; or to damp or wet surfaces. Comply with manufacturer's recommendation when they are more stringent with respect to application temperatures.
  - 4. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by the manufacturer during application and drying periods.

## **1.8 MAINTENANCE**

- A. Extra Materials: Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner and store where directed.
  - 1. Quantity: Furnish Owner with an additional 3%, but not less than 1 gal. (3.8 L) or 1 case, as appropriate, of each material and color applied.

## **PART 2 - PRODUCTS**

### **2.1 PAINT COLOR TYPES**

- A. The Architect's selection of paint colors are indicated by color type; designated "PT- ". Reference to a particular manufacturer's number or color name is used only as a convenience for the Architect in order to establish the Project color requirements. These references are not intended to describe the required generic paint systems. For generic paint systems requirements, refer to the "Schedule of Exterior Paints and Coatings" and the "Schedule of Interior Paints and Coatings" as applicable to the respective conditions of use.
- B. Except as otherwise noted, use flat finish on ceilings and soffits, eggshell finish on walls and fascias, satin or semi-gloss finish on doors and frames, semi-gloss finish on metal trim, and epoxy finish on ceilings and walls in wet spaces where shown or specified.
- C. Samples showing color and sheen selected by the Architect for specific items or areas specified to receive paint finishes are available for examination in the Architect's office.
- D. Color Schedule: The following schedule shall be considered as a guide only to color requirements, subject to the Architect's modification or approval:
  - 1. PT-01: Interior Latex Flat
    - a. Swiss Coffee OC-45 (Benjamin Moore)
  - 2. PT-02: Interior Latex Satin
    - a. Fossil AD-65 (Benjamin Moore)
  - 3. PT-03: Interior Latex Eggshell
    - a. Chantilly Lace OC-65 (Benjamin Moore)
  - 4. PT-04: Interior Latex Eggshell Satin
    - a. Chantilly Lace OC-65 (Benjamin Moore)
  - 5. PT-05: Interior Latex Eggshell Satin
    - a. Sea Pearl OC-19 (Benjamin Moore)
  - 6. PT-10: Exterior Acrylic Eggshell
    - a. Winters Gate 2238 (Pratt and Lambert)
  - 7. PT-11: Exterior Acrylic Satin
    - a. Match exiting yellow trim (RAL 1014)
  - 8. PT-12: Exterior Acrylic Satin
    - a. Match exiting red trim (RAL 2001)
  - 9. PT-13: Exterior Acrylic Satin
    - a. Match exiting grey trim (RAL 6008)

## **2.2 MATERIALS**

- A. Material Compatibility: Provide block fillers, primers, finish coat materials, and related materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by the manufacturer based on testing and field experience.
- B. Paint Materials: Subject to compliance with requirements, provide materials from the following manufacturers:
  - 1. Exterior
    - b. Amercoat
    - c. Carboline
    - d. DuPont
    - e. Dunn-Edwards
    - f. PPG Paints
    - g. Sherwin-Williams
    - h. Tnemec
  - 2. Interior
    - a. Amercoat
    - b. Benjamin Moore
    - c. Carboline
    - d. Dunn-Edwards
    - e. Kelly-Moore
    - g. PPG Paints
    - h. Sherwin-Williams
    - i. Vista Paint
- C. Use products of the same manufacturer for succeeding coats. Where primer is shop applied to steel, subsequent coats may be the product of another manufacturer provided the coatings are mutually compatible. Review other sections in which primers are provided to ensure compatibility of the total systems for various substrates.
- D. Chemical Component Limitations: Provide products that comply with the following limits for VOC content, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and the following chemical restrictions:
  - 1. Flat Paints and Coatings: VOC content of not more than 50 g/L.
  - 2. High Gloss Nonflat Paints and Coatings: VOC content of not more than 150 g/L.
  - 3. Nonflat Paints and Coatings: VOC content of not more than 100 g/L.
  - 4. Concrete/Masonry Sealers: VOC content of not more than 100 g/L.
  - 5. Fire-Resistive Coatings: VOC content of not more than 350 g/L.
  - 6. Metallic Pigmented Coatings: VOC content of not more than 500 g/L.
  - 7. Primers, Sealers and Undercoaters: VOC content of not more than 100 g/L.



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8. Rust-Preventative Coatings: VOC content of not more than 250 g/L.
  9. Specialty Primers, Sealers, and Undercoaters: VOC content of not more than 100 g/L.
  10. Shellacs, Clear: VOC content of not more than 730 g/L.
  11. Industrial Maintenance Coatings:
    - a. High Temperature Coatings: VOC content of not more than 420 g/L.
    - b. Zinc Rich Industrial Maintenance Primers: VOC content of not more than 340 g/L.
    - c. Other: VOC content of not more than 250 g/L
  12. Pretreatment Wash Primers: VOC content of not more than 420 g/L.
  13. Floor Coatings: VOC content of not more than 100 g/L.
- E. Chemical Component Limitations: Provide products that comply with the following limits for VOC content, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and the following chemical restrictions:
1. Flat Paints and Coatings: VOC content of not more than 50 g/L.
  2. Nonflat Paints and Coatings: VOC content of not more than 50 g/L
  3. Waterproofing Concrete/Masonry Sealers: VOC content of not more than 100 g/L.
  4. Concrete Surface Retarder: VOC content of not more than 50 g/L.
  5. Fire-Resistive Coatings: VOC content of not more than 150 g/L.
  6. Metallic Pigmented Coatings: VOC content of not more than 150 g/L.
  7. Primers, Sealers and Undercoaters: VOC content of not more than 100 g/L.
  8. Rust-Preventative Coatings: VOC content of not more than 100 g/L.
  9. Specialty Primers, Sealers, and Undercoaters: VOC content of not more than 100 g/L.
  10. Shellacs, Clear: VOC content of not more than 730 g/L.
  11. Stains:
    - a. Interior: VOC content of not more than 100 g/L.
    - b. Exterior: VOC content of not more than 250 g/L.
  12. Industrial Maintenance Coatings:



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- a. High Temperature Coatings: VOC content of not more than 420 g/L.
  - b. Non-Sacrificial Anti-Graffiti Coatings: VOC content of not more than 100 g/L.
  - c. Sacrificial Anti-Graffiti Coatings: VOC content of not more than 50 g/L.
  - d. Zinc Rich Industrial Maintenance Primers: VOC content of not more than 100 g/L.
13. Pretreatment Wash Primers: VOC content of not more than 420 g/L.
- F. Chemical Components of Field-Applied Interior Painting: Provide products that comply with the following limits for VOC content, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and the following chemical restrictions; these requirements do not apply to primers or finishes that are applied in a fabrication or finishing shop:
1. Interior Flat Coating or Primer: VOC content of not more than 50 g/L.
  2. Interior Nonflat Coating or Primer: VOC content of not more than 150 g/L.
  3. Rust-Preventative Coatings: VOC content of not more than 100 g/L.
  4. Waterproofing Concrete/Masonry Sealers: VOC content of not more than 400 g/L.
  5. Sealers and Undercoaters: VOC content of not more than 200 g/L.
  6. Shellacs, Clear: VOC content of not more than 730 g/L.
  7. Stains:
    - a. Interior: VOC content of not more than 100 g/L.
    - b. Exterior: VOC content of not more than 250 g/L.
  8. Floor Coatings: VOC content of not more than 50 g/L.
- G. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
- H. Restricted Components: Paints and coatings shall not contain any of the following chemicals nor other restricted components and/or chemicals not in compliance with governing authorities having jurisdiction:
1. Acrolein.
  2. Acrylonitrile.
  3. Antimony.
  4. Benzene.
  5. Butyl benzyl phthalate.
  6. Cadmium.
  7. Di (2-ethylhexyl) phthalate.



8. Di-n-butyl phthalate.
9. Di-n-octyl phthalate.
10. 1,2-dichlorobenzene.
11. Diethyl phthalate.
12. Dimethyl phthalate.
13. Ethylbenzene.
14. Formaldehyde.
15. Hexavalent chromium.
16. Isophorone.
17. Lead.
18. Mercury.
19. Methyl ethyl ketone.
20. Methyl isobutyl ketone.
21. Methylene chloride.
22. Naphthalene.
23. Toluene (methylbenzene).
24. 1,1,1-trichloroethane.
25. Vinyl chloride.

- I. Colors, textures and degree of luster will be as selected by the Architect. Tint primer and undercoats approximately to the shade of the final coat but with sufficient variation to distinguish them from the preceding coat. Proprietary names used to designate colors or materials are not intended to imply that products named are required or to exclude equal products of other manufacturers.
- J. In locations where ambient temperature-humidity conditions encourage the ready formation of mildew, use paints with additional mildew inhibitive agent incorporated during the manufacturing process, of type and in concentration recommended by the paint manufacturer to withstand such mildew formation.

## **2.3 SCHEDULE OF EXTERIOR PAINTS AND COATINGS**

- A. General: Paint exterior surfaces exposed to view in accordance with this Schedule of Exterior Paints and Coatings, except as specifically shown or specified.

- B. Metals

1. Ferrous Metal

- a. When Shop-Primed with Universal Alkyd Primer: Apply two coats with the manufacturer recommended dry film thickness for each coat; semi-gloss or satin finish coats; compatible with primer; one of the following:

"Carbothane 133 MC" (Carboline Co.); 3.0 - 5.0 mils d.f.t.

"BRP 1501 Satin Acrylic Urethane" (PPG Paints); 1.5-2.0 mils d.f.t.

"Hi Solids Polyurethane" (Sherwin Williams); 3.0 - 5.0 mils d.f.t.

"Endura-Shield II Series 1075" (Tnemec Co. Inc.); 3.0 - 5.0 mils d.f.t.

- b. When Shop-Primed with Zinc-Rich Primer: Apply two coats with the manufacturer recommended dry film thickness for each coat; semi-gloss or satin finish coat; compatible with primer:

1<sup>st</sup> coat: One of the following:

"Carboguard 893" (Carboline Co.); 4.0 - 6.0 mils d.f.t.



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"ADS573/574, Coraflon ADS Epoxy Inter. Primer" (PPG Paints); 2.0-5.0 mils d.f.t.

"Macropoxy 646 Epoxy" (Sherwin Williams); 4.0 - 6.0 mils d.f.t.

"Hi-Build Epoxoline II Series V69" (Tnemec Co. Inc.); 4.0 - 6.0 mils d.f.t.

2<sup>nd</sup> coat: One of the following:

"Carbothane 133 MC" (Carboline Co.); 3.0 - 5.0 mils d.f.t.

"BRP 1501 Satin Acrylic Urethane" (PPG Paints); 1.5-2.0 mils d.f.t.

"Hi Solids Polyurethane" (Sherwin Williams); 3.0 - 5.0 mils d.f.t.

"Endura Shield II Series 1075" (Tnemec Co. Inc.); 3.0 - 5.0 mils d.f.t.

2. Galvanized Metal: Compatible with the surface preparer. Provide the manufacturer recommended dry film thickness for each coat; semi-gloss finish coats; one of the following systems:

Dunn-Edwards:

1<sup>st</sup> coat - "GALV-ALUM Premium, Non-Ferrous Metal Primer GAPR00"; 2.0 mils d.f.t.

2<sup>nd</sup> coat - "SPARTASHIELD, 100% Acrylic Semi-Gloss SSSL50"; 1.5 mils d.f.t.

3<sup>rd</sup> coat - "SPARTASHIELD, 100% Acrylic Semi-Gloss SSSL50"; 1.5 mils d.f.t.

PPG Paints:

1<sup>st</sup> coat - "Devflex 4020PF, Rust Preventative Int/Ext Primer"; 2.2-3.5 mils d.f.t.

2<sup>nd</sup> coat - "2406V Fortis 350, 100% Acrylic Ext Semi-Gloss" or? "Devguard 4306 Rust Preventative Semi-Gloss Enamel"?; 1.4-1.6 mils d.f.t.

3<sup>rd</sup> coat - "2406V Fortis 350, 100% Acrylic Ext Semi-Gloss" or? "Devguard 4306 Rust Preventative Semi-Gloss Enamel"?; 1.4-1.6 mils d.f.t.

Sherwin-Williams:

1<sup>st</sup> coat - "Macropoxy 646 Epoxy"; 4.0 - 8.0 mils d.f.t.

2<sup>nd</sup> coat - "Pro Industrial Acrylic"; 2.0 mils d.f.t.

3<sup>rd</sup> coat - "Pro Industrial Acrylic"; 2.0 mils d.f.t.

3. Stainless Steel: Compatible with the surface preparer. Provide the manufacturer recommended dry film thickness for each coat; semi-gloss finish coats;

1<sup>st</sup> coat - Epoxy Primer

2<sup>nd</sup> coat - High Build Aliphatic Polyurethane; 3.0 - 5.0 mils d.f.t.

- C. Cement Plaster: One of the following systems.

Dunn-Edwards:

1<sup>st</sup> coat - "EFF-STOP Masonry Primer/Sealer ESPR00"; 2.0 mils d.f.t.

2<sup>nd</sup> coat - "SPARTASHIELD, 100% Acrylic Flat SSSL10"; 1.5 mils d.f.t.

3<sup>rd</sup> coat - "SPARTASHIELD, 100% Acrylic Flat SSSL10"; 1.5 mils d.f.t.

PPG Paints:

1<sup>st</sup> coat - "Hydrosealer 6001 100% Acrylic Bonding Primer Sealer"; 1.4-1.7 mils d.f.t.

2<sup>nd</sup> coat - "2200V Fortis 350, 100% Acrylic Ext Flat"; 1.5-1.7 mils d.f.t.

3<sup>rd</sup> coat - "2200V Fortis 350, 100% Acrylic Ext Flat"; 1.5-1.7 mils d.f.t.

Sherwin-Williams:

1<sup>st</sup> coat - "Loxon Masonry Primer A24W8300"; 3.7 mils d.f.t.

2<sup>st</sup> coat - "A-100 Ext Flat A6"; 1.2 mils d.f.t.



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3<sup>rd</sup> coat - "A-100 Ext Flat A6"; 1.2 mils d.f.t.

**D. Concrete, Concrete Masonry Units: One of the following systems.**

**Dunn-Edwards:**

1<sup>st</sup> coat - "Smooth BLOCFIL SBPR00"; 3.5 mils d.f.t.

2<sup>nd</sup> coat - "FLEX-TEX, Elastomeric Coating Smooth FTXS10"; 7-8 mils d.f.t.

3<sup>rd</sup> coat - "FLEX-TEX, Elastomeric Coating Smooth FTXS10"; 7-8 mils d.f.t.

**PPG Paints:**

1<sup>st</sup> coat - "3010 Glidden Professional Block Filler/Primer Int/Ext"; 9.0-13.6 mils d.f.t.

2<sup>nd</sup> coat - "Decraflex 300 - Smooth Elastomeric Coating"; 6.0-12 mils d.f.t.

3<sup>rd</sup> coat - "Decraflex 300 - Smooth Elastomeric Coating"; 6.0-12 mils d.f.t.

**Sherwin-Williams:**

1<sup>st</sup> coat - "PrepRite Block Filler B25W25"; 8.0 mils d.f.t.

2<sup>nd</sup> coat - "Sherlastic A5-100 Smooth Textured"; 8.0 – 12.0 mils d.f.t.

3<sup>rd</sup> coat - "Sherlastic A5-100 Smooth Textured"; 8.0 – 12.0 mils d.f.t.

**E. Concrete, Poured/Tilt Up: One of the following systems.**

**Dunn-Edwards:**

1<sup>st</sup> coat - "EFF-STOP Masonry Primer/Sealer ESPR00"; 2.0 mils d.f.t.

2<sup>nd</sup> coat - "FLEX-TEX, Elastomeric Coating Smooth FTXS10"; 7-8 mils d.f.t.

3<sup>rd</sup> coat - "FLEX-TEX, Elastomeric Coating Smooth FTXS10"; 7-8 mils d.f.t.

**PPG Paints**

1<sup>st</sup> coat - "6001 Hydrosealer" OR if porous substrate, "3010 Glidden Professional Block Filler/Primer Int/Ext"; 9.0-13.6 mils d.f.t.

2<sup>nd</sup> coat - "Decraflex 300 - Smooth Elastomeric Coating"; 6.0-12 mils d.f.t.

3<sup>rd</sup> coat - "Decraflex 300 - Smooth Elastomeric Coating"; 6.0-12 mils d.f.t.

**Sherwin-Williams:**

1<sup>st</sup> coat - "Loxon Masonry Primer A24W8300"; 3.7 mils d.f.t.

2<sup>nd</sup> coat - "Sherlastic A5-100 Smooth Textured"; 8.0 – 12.0 mils d.f.t.

3<sup>rd</sup> coat - "Sherlastic A5-100 Smooth Textured"; 8.0 – 12.0 mils d.f.t.

**F. Wood**

1. Stain Finish: As specified in Section 06 40 00 "Architectural Woodwork".

2. Gloss, Semi-Gloss or Eggshell Finish: One of the following systems.

**Dunn-Edwards:**

1<sup>st</sup> coat - "E-Z Prime, Exterior Wood Primer EZPR00"; 2.0 mils d.f.t.

2<sup>nd</sup> coat - "SPARTASHIELD, 100% Acrylic SSHL Series"; 1.5 mils d.f.t.

3<sup>rd</sup> coat - "SPARTASHIELD, 100% Acrylic SSHL Series"; 1.5 mils d.f.t.

**PPG Paints:**

1<sup>st</sup> coat - "Hydrosealer 6001 100% Acrylic Bonding Primer Sealer"; 1.4-1.7 mils d.f.t.

2<sup>nd</sup> coat - "2406V Fortis 350, 100% Acrylic Semi-Gloss" or "GP1506 Lifemaster Oil Interior/Exterior Semi-Gloss"; 1.5-1.7 mils d.f.t.

3<sup>rd</sup> coat - "2402V Fortis 350, 100% Acrylic Semi-Gloss" or "GP1506 Lifemaster

Oil Interior/Exterior Semi-Gloss"?; 1.5-1.7 mils d.f.t.

Sherwin Williams:

1<sup>st</sup> coat - "Exterior Latex Wood Primer B42W8041"; 1.4 mils d.f.t.

2<sup>nd</sup> coat - "Solo Semi-Gloss A76"; 1.5 mils d.f.t.

3<sup>rd</sup> coat - "Solo Semi-Gloss A76"; 1.5 mils d.f.t.

3. Flat Finish: One of the following systems.

Dunn-Edwards:

1<sup>st</sup> coat - "E-Z Prime, Exterior Wood Primer EZPR00"; 2.0 mils d.f.t.

2<sup>nd</sup> coat - "SPARTASHIELD, 100% Acrylic Flat SSSL10"; 1.5 mils d.f.t.

3<sup>rd</sup> coat - "SPARTASHIELD, 100% Acrylic Flat SSSL10"; 1.5 mils d.f.t.

PPG Paints:

1<sup>st</sup> coat - "Hydrosealer 6001 100% Acrylic Bonding Primer Sealer"; 1.4-1.7 mils d.f.t.

2<sup>nd</sup> coat - "2200V Fortis 350, 100% Acrylic Ext Flat"; 1.5-1.7 mils d.f.t.

3<sup>rd</sup> coat - "2200V Fortis 350, 100% Acrylic Ext Flat"; 1.5-1.7 mils d.f.t.

Sherwin Williams:

1<sup>st</sup> coat - "Exterior Latex Wood Primer B42W8041"; 1.4 mils d.f.t.

2<sup>nd</sup> coat - "A-100 Ext Flat A6"; 1.2 mils d.f.t.

3<sup>rd</sup> coat - "A-100 Ext Flat A6"; 1.2 mils d.f.t.

## **2.4 SCHEDULE OF INTERIOR PAINTS AND COATINGS**

A. General: Paint interior surfaces exposed to view in accordance with this Schedule of Interior Paints and Coatings, except as specifically shown or specified.

B. Ferrous Metal

1. Metals, Shop-Primed: One of the following systems.

Dunn-Edwards:

1<sup>st</sup> coat - "BLOC-RUST BRPR00"; 2.0 mils d.f.t.

2<sup>nd</sup> coat - "SPARTASHIELD, 100% Acrylic Semi-Gloss SSSL50"; 1.5 mils d.f.t.

PPG Paints:

1<sup>st</sup> coat - "Devflex 4020PF, Rust Preventative Int/Ext Primer"; 2.2-3.5 mils d.f.t.

2<sup>nd</sup> coat - "Devflex High Performance Waterborne Acrylic Semi-Gloss Enamel 4216HP"; 1.4-1.6 mils d.f.t.

Sherwin-Williams:

1<sup>st</sup> coat - "ProCryl Universal Metal Primer B66-310"; 2.0-4.0 mils d.f.t.

2<sup>nd</sup> coat - "Pro Industrial Acrylic EG B66 Series"; 2.5-4.0 mils d.f.t.

2. Galvanized: One of the following systems.

Dunn-Edwards:

1<sup>st</sup> coat - "ULTRA-GRIP Metal Primer UGPR00"; 1.5 mils d.f.t.

2<sup>nd</sup> coat - "SPARTASHIELD, 100% Acrylic Eggshell SSSL30"; 1.5 mils d.f.t.

3<sup>rd</sup> coat - "SPARTASHIELD, 100% Acrylic Eggshell SSSL30"; 1.5 mils d.f.t.



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**PPG Paints:**

- 1<sup>st</sup> coat - "Devflex 4020PF, Rust Preventative Int/Ext Primer"; 2.2-3.5 mils d.f.t.
- 2<sup>nd</sup> coat - "Devflex High Performance Waterborne Acrylic Semi-Gloss Enamel 4216HP"; 1.4-1.6 mils d.f.t.
- 3<sup>rd</sup> coat - "Devflex High Performance Waterborne Acrylic Semi-Gloss Enamel 4216HP"; 1.4-1.6 mils d.f.t.

**Sherwin-Williams:**

- 1<sup>st</sup> coat - "ProCryl Universal Metal Primer B66-310"; 2.0-4.0 mils d.f.t.
- 2<sup>nd</sup> coat - "Pro Industrial Acrylic EG B66 Series"; 2.5-4.0 mils d.f.t.
- 3<sup>rd</sup> coat - "Pro Industrial Acrylic EG B66 Series"; 2.5-4.0 mils d.f.t.

- 3. Semi-Gloss Epoxy Finish: One of the following systems.

**Carboline:**

- 1<sup>st</sup> coat - "Carboguard 890 VOC"; 4.0 - 6.0 mils d.f.t.
- 2<sup>nd</sup> coat - "Carboguard 890 VOC"; 4.0 - 6.0 mils d.f.t.

**PPG Paints:**

- 1<sup>st</sup> coat - "Pitt-Tech Plus Int/Ext DTM Industrial Primer"; 2.0-4.0 mils d.f.t.
- 2<sup>nd</sup> coat - "Pitt-Glaze WB1 Interior Epoxy"; 1.5-3.0 mils d.f.t.
- 3<sup>rd</sup> coat - "Pitt-Glaze WB1 Interior Epoxy"; 1.5-3.0 mils d.f.t.

**Sherwin-Williams:**

- 1<sup>st</sup> coat - "Pro Industrial ProCryl Primer"; 2.0 mils d.f.t.
- 2<sup>nd</sup> coat - "Pro Industrial WB Cat Epoxy; B73 Series"; 2.0-4.0 mils d.f.t.
- 3<sup>rd</sup> coat - "Pro Industrial WB Cat Epoxy; B73 Series "; 2.0-4.0 mils d.f.t.

- C. Plaster, Gypsum Board and Fiberglass Reinforced Gypsum

- 1. Flat Finish: One of the following systems.

**Dunn-Edwards:**

- 1<sup>st</sup> coat - "ENSO Primer, ENSO00"; 1.5 mils d.f.t.
- 2<sup>nd</sup> coat - "ENSO Flat, ENSO10"; 1.5 mils d.f.t.
- 3<sup>rd</sup> coat - "ENSO Flat, ENSO10"; 1.5 mils d.f.t.

**PPG Paints:**

- 1<sup>st</sup> coat - "9-900 Pure Performance Primer"; 1.6 mils d.f.t.
- 2<sup>nd</sup> coat - "9-100 Pure Performance 100% Acrylic Zero VOC"; 1.6 mils d.f.t.
- 3<sup>rd</sup> coat - "9-100 Pure Performance 100% Acrylic Zero VOC"; 1.6 mils d.f.t.

**Sherwin Williams:**

- 1<sup>st</sup> coat - "ProMar 200 Zero VOC Interior Latex Primer"; 1.3 mils d.f.t.
- 2<sup>nd</sup> coat - "ProMar 200 Zero VOC Interior Latex, Flat"; 1.8 mils d.f.t.
- 3<sup>rd</sup> coat - "ProMar 200 Zero VOC Interior Latex, Flat"; 1.8 mils d.f.t.

- 2. Eggshell and Satin Finish: One of the following systems.

**Dunn-Edwards:**

- 1<sup>st</sup> coat - "ENSO Primer, ENSO00"; 1.5 mils d.f.t.
- 2<sup>nd</sup> coat - "ENSO Eggshell, ENSO30"; 1.5 mils.
- 3<sup>rd</sup> coat - "ENSO Eggshell, ENSO30"; 1.5 mils.



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**PPG Paints:**

- 1<sup>st</sup> coat - "9-900 Pure Performance Primer"; 1.6 mils d.f.t.
- 2<sup>nd</sup> coat - "9-300 Pure Performance 100% Acrylic Zero VOC"; 1.5 mils d.f.t.
- 3<sup>rd</sup> coat - "9-300 Pure Performance 100% Acrylic Zero VOC"; 1.5 mils d.f.t.

**Sherwin-Williams:**

- 1<sup>st</sup> coat - "ProMar 200 Zero VOC Interior Latex Primer"; 1.3 mils d.f.t.
- 2<sup>nd</sup> coat - "ProMar 200 Zero VOC Interior Latex, Eg-Shel"; 1.7 mils d.f.t.
- 3<sup>rd</sup> coat - "ProMar 200 Zero VOC Interior Latex, Eg-Shel"; 1.7 mils d.f.t.

- 3. Semi-Gloss Epoxy Finish: One of the following systems.

**Carboline:**

- 1<sup>st</sup> coat - "Sanitile 120"; 1.2 - 1.5 mils d.f.t.
- 2<sup>nd</sup> coat - "Sanitile 255 WB"; 2.0 - 3.0 mils d.f.t.
- 3<sup>rd</sup> coat - "Sanitile 255 WB"; 2.0 - 3.0 mils d.f.t.

**PPG Paints:**

- 1<sup>st</sup> coat - "Seal Grip 17-921"; 1.6 mils d.f.t.
- 2<sup>nd</sup> coat - "Pitt-Glaze 16-510 WB1 Precat Epoxy"; 1.5 mils d.f.t.
- 3<sup>rd</sup> coat - "Pitt-Glaze 16-510 WB1 Precat Epoxy"; 1.5 mils d.f.t.

**Sherwin-Williams:**

- 1<sup>st</sup> coat - "Pro Mar 200 Zero VOC Primer"; 2.0 mils d.f.t.
- 2<sup>nd</sup> coat - "Pro Industrial WB Cat Epoxy"; 2.0 - 4.0 mils d.f.t.
- 3<sup>rd</sup> coat - "Pro Industrial WB Cat Epoxy"; 2.0 - 4.0 mils d.f.t.

**D. Concrete, Concrete Masonry Units**

- 1. Polyurethane Finish: One of the following systems.

**PPG Paints**

- 1<sup>st</sup> coat - "ADS573/574, Corafon ADS Epoxy Intermediate Primer" 2.0-5.0 mils d.f.t.
- 2<sup>nd</sup> coat - "BRP "1501 Low VOC Satin Acrylic Urethane"; 1.5-2.0 d.f.t.
- 3<sup>rd</sup> coat - "BRP "1501 Low VOC Satin Acrylic Urethane"; 1.5-2.0 d.f.t

**Sherwin-Williams:**

- 1<sup>st</sup> coat - "Lozon Concrete & Masonry Primer A24W8300"; 2.5 mils and as necessary to uniformly seal substrate.
- 2<sup>nd</sup> coat - "Waterbased Acrolon 100 Urethane B65-720/B65V720"; 3 mils d.f.t.
- 3<sup>rd</sup> coat - "Waterbased Acrolon 100 Urethane B65-720/B65V720"; 3 mils d.f.t.

- 2. Enamel Finish: One of the following systems.

**PPG Paints:**

- 1<sup>st</sup> coat - "3010 Block Filler Primer Int/Ext";
- 2<sup>nd</sup> coat - "1502 WB Alkyd Egg Int/Ext" or "Devflex 4212 High Performance Eggshell Enamel"; 1.5-2.0 mils d.f.t.
- 3<sup>rd</sup> coat - "1502 WB Alkyd Egg Int/Ext" or "Devflex 4212 High Performance Eggshell Enamel"; 1.5-2.0 mils d.f.t.

**Sherwin-Williams:**

- 1<sup>st</sup> coat - "PrepRite Block Filler B25W25"; 8.0 mils d.f.t.



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2<sup>nd</sup> coat - "ProClassic h2o Borne Alkyd B33W851"; 1.6 mils d.f.t.  
3<sup>rd</sup> coat - "ProClassic h2o Borne Alkyd B33W851"; 1.6 mils d.f.t.

3. Epoxy Finish: One of the following systems.

Carboline:

1<sup>st</sup> coat - "Sanitile 100"; 12 mils d.f.t.  
2<sup>nd</sup> coat - "Carboguard 890 VOC Epoxy"; 4.0 mils d.f.t.  
3<sup>rd</sup> coat - "Carboguard 890 VOC Epoxy"; 4.0 mils d.f.t.

PPG Paints:

1<sup>st</sup> coat - "6-15 SpeedHide Int/Ext Acrylic Masonry Block Filler"; 7.2-14.4 mils d.f.t.  
2<sup>nd</sup> coat - "Pitt-Glaze 16-510 WB1 Precat Epoxy"; 1.5 mils d.f.t.  
3<sup>rd</sup> coat - "Pitt-Glaze 16-510 WB1 Precat Epoxy"; 1.5 mils d.f.t.

Sherwin-Williams:

1<sup>st</sup> coat - "Heavy Duty Block Filler"; 12.5 mils d.f.t.  
2<sup>nd</sup> coat - "Pro Industrial WB Cat Epoxy"; 2.0 - 4.0 mils d.f.t.  
3<sup>rd</sup> coat - "Pro Industrial WB Cat Epoxy "; 2.0 - 4.0 mils d.f.t.

4. Semi-Gloss Epoxy Finish Utilized as Access Floor Concrete Slab Sealer: One of the following systems.

PPG Paints:

1<sup>st</sup> coat - "Nu-Klad 128"; 2.0-4.0 mils d.f.t.  
2<sup>nd</sup> coat - "Nu-Klad 128"; 2.0-4.0 mils d.f.t.

Sherwin Williams:

1<sup>st</sup> coat - "GP3460"; 2.0-4.0 mils d.f.t.  
2<sup>nd</sup> coat - "GP3462"; 2.0-4.0 mils d.f.t.

E. Wood, Except Shop Finished: One of the following systems.

Dunn-Edwards:

1<sup>st</sup> coat - "ULTRA-GRIP Metal Primer UGPR00"; 1.5 mils.  
2<sup>nd</sup> coat - "SPARTASHIELD, 100% Acrylic Eggshell SSSL30"; 1.5 mils  
3<sup>rd</sup> coat - "SPARTASHIELD, 100% Acrylic Eggshell SSSL30"; 1.5 mils

PPG Paints:

1<sup>st</sup> coat - "9-900 Pure Performance Primer" or "PPG Seal Grip Interior/Exterior Acrylic Universal Primer/Sealer"; 1.6 mils d.f.t.  
2<sup>nd</sup> coat - "9-300 Pure Performance 100% Acrylic Zero VOC" or "Devflex 4216 High Performance Waterborne Acrylic Semi-Gloss Enamel"; 1.5 mils-4.0 d.f.t.  
3<sup>rd</sup> coat - "9-300 Pure Performance 100% Acrylic Zero VOC" or "Devflex 4216 High Performance Waterborne Acrylic Semi-Gloss Enamel"; 1.5-4.0 mils d.f.t.

Sherwin Williams:

1<sup>st</sup> coat - "PrepRite ProBlock Primer B51-620"; 1.5 mils.  
2<sup>nd</sup> coat - "ProClassic h2o Borne Alkyd B33W851"; 1.6 mils d.f.t.  
3<sup>rd</sup> coat - "ProClassic h2o Borne Alkyd B33W851"; 1.6 mils d.f.t.

F. Piping and Mechanical Equipment: Paint piping, pipe hangers and supports, heat exchangers, tanks, ductwork, insulation, motors, electrical conduits, switchgear and other



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mechanical and electrical equipment except equipment which is non-ferrous metal, plated, finished by manufacturers, permanently concealed or noted to be painted under other Sections. Properly clean, prepare and finish as specified. Paint materials shall be heat-resisting type when applied to heating lines and equipment.

1. Ductwork at Grilles and Diffusers: Apply to visible interior surfaces of ductwork. One of the following systems.

Dunn-Edwards:

1<sup>st</sup> coat - "SPARTASHIELD, 100% Acrylic Semi-Gloss SSSL50"; 1.5 mils.

2<sup>nd</sup> coat - "SPARTASHIELD, 100% Acrylic Semi-Gloss SSSL50"; 1.5 mils.

PPG Paints:

1<sup>st</sup> coat - "Devflex 4020PF, Rust Prevent Int/Ext Primer"; 2.2-3.5 mils d.f.t

2<sup>nd</sup> coat - "Devflex 4216 High Performance Waterborne Acrylic Semi-Gloss Enamel"; 1.5-4.0 mils d.f.t.

Sherwin-Williams:

1<sup>st</sup> coat - "Pro-Cryl Universal Primer B66-00310"; 2.0-4.0 mils d.f.t.

2<sup>nd</sup> coat - "Pro Industrial Acrylic Semi-Gloss B66-00651"; 2.5 - 4.0 mils d.f.t.

2. Exposed Uninsulated Piping Ductwork, Fittings and Equipment

Dunn-Edwards:

1<sup>st</sup> coat - "ULTRA-GRIP Metal Primer UGPR00"; 1.5 mils.

2<sup>nd</sup> coat - "SPARTASHIELD, 100% Acrylic Eggshell SSSL30"; 1.5 mils.

PPG Paints:

1<sup>st</sup> coat - "Devflex 4020PF, Rust Prev. Int/Ext Primer 2.2-3.5 mils d.f.t

2<sup>nd</sup> coat - "Devflex 4216L DTM, Rust Prev. Int/Ext Acr. SG"; 1.5-4.0 mils d.f.t.

Sherwin-Williams:

1<sup>st</sup> coat - "Pro-Cryl Universal Primer B66-00310"; 2.0-4.0 mils d.f.t.

2<sup>nd</sup> coat - "Pro Industrial Acrylic Eg-Shel B66-00661"; 2.5 - 4.0 mils d.f.t.

3. Exposed Insulated Piping, Ductwork, Fittings and Equipment: One of the following systems.

Dunn-Edwards:

1<sup>st</sup> coat - "ULTRA-GRIP Metal Primer UGPR00"; 1.5 mils.

2<sup>nd</sup> coat - "SPARTASHIELD, 100% Acrylic Semi-Gloss SSSL50"; 1.5 mils

PPG Paints:

1<sup>st</sup> coat - "Devflex 4020PF, Rust Prevent Int/Ext Primer"; 2.2-3.5 mils d.f.t

2<sup>nd</sup> coat - "Devflex 4216L DTM, Rust Prev. Int/Ext Acrylic SG"; 1.5-4.0 mils d.f.t.

Sherwin-Williams:

1<sup>st</sup> coat - "Pro-Cryl Universal Primer B66-00310"; 2.0-4.0 mils d.f.t.

2<sup>nd</sup> coat - "Pro Industrial Acrylic Semi-Gloss B66-00651"; 2.5 - 4.0 mils d.f.t.

4. Machinery and Equipment: One of the following systems.

PPG Paints:

1<sup>st</sup> coat - "Ameron Amerlock 2VOC"; 4.0-8.0 mils d.f.t.



2<sup>nd</sup> coat - "Ameron Amerlock 2VOC"; 4.0-8.0 mils d.f.t.

Sherwin-Williams:

1<sup>st</sup> coat - "Macropoxy 646"; 4.0-8.0 mils d.f.t.

2<sup>nd</sup> coat - "Macropoxy 646"; 4.0-8.0 mils d.f.t.

**5. Pipe Identification**

- a. Comply with ANSI A13.1 "Scheme for the Identification of Piping Systems".
- b. Provide plastic coated fabric pipe markers, "All-Temperature" labels (W.H. Brady), or approved equal. Indicate the pipe contents in printed, block letters. Provide labels of such length as to completely circumscribe the pipe and overlap not less than 1 in. (25mm) upon one edge.
- c. Provide flow markers consisting of labels similar to the pipe markers with a large black arrow printed on the same background color to indicate the direction of flow of material in the pipe.
- d. On each side of walls or floors through which pipes pass, place a pipe marker and a flow marker on each pipe. Place markers adjacent to valves and fittings. For exposed piping locate markers to be clearly visible to a person standing on the floor.
- e. On pipes or covering 1 in. (25mm) and smaller in diameter requiring identifying markings, attach metal tag of not less than 1 in. (25mm) in diameter, with lettering etched and filled with enamel, in lieu of stencils.

**PART 3 - EXECUTION**

**3.1 GENERAL**

- A. Manufacturer's Instructions: Prepare substrates, apply primers and apply the work of this Section, including equipment, components, and accessories in accordance with the manufacturer's instructions, except where more stringent requirements are shown or specified, and where project conditions require extra precautions or provisions to ensure satisfactory performance of the Work.

**3.2 EXAMINATION**

- A. Verification of Conditions: Examine the areas to receive the Work and the conditions under which the Work would be performed. Remedy conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

**3.3 PREPARATION**

- A. Substrate Acceptability: Commencement of installation shall constitute acceptance of substrate conditions by the Installer.
- B. Surface Preparation, General
  1. Prepare surfaces to receive paint; thoroughly clean of grime, grease, dirt, loose

material and other substances that may interfere with proper adhesion of paint. Provide barrier coats over incompatible primers or remove and reprime. Paint dry surfaces only.

2. Remove or protect hardware, hardware accessories, plates, signs, trim for mechanical work, machined surfaces, lighting fixtures and similar items in place and not to be finish painted. Disconnect and move equipment adjacent to areas scheduled to be painted. Reposition and reconnect items and remove protection upon completion of each space.
3. Cleaning: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease prior to cleaning. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
4. Fill dents, cracks, hollow places, open joints and other irregularities with a filler suitable for the purpose and, after setting, sand to a smooth finish.
5. Prime surfaces not more than 8 hours after cleaning except as otherwise specified by the prime paint manufacturer.

**C. Metals, Surface Preparation**

1. General: Clean bare metal surfaces thoroughly of foreign matter such as mortar, plaster, grease, rust, scale and dirt before priming coat is applied. Remove oil, grease and similar contaminants in accordance with SSPC SP-1 "Solvent Cleaning", prior to additional surface preparation specified. Remove rust and mill scale in accordance with SSPC SP-3 "Power Tool Cleaning". Where solder flux has been used, clean surface with solvent, or use mechanical tools to remove. Immediately after surface preparation, apply primer in accordance with manufacturer's instructions. Use painting methods which will result in full coverage and dry film thickness specified. After erection is completed, touch-up heads of bolts, welded surfaces and other field connections with specified primer.
2. Shop Primed Ferrous Metal Surfaces: Remove grease and oil with a cleaner recommended for the purpose. For exterior exposed steel, follow cleaning by abrading all epoxy shop coated surfaces as recommended by manufacturer to provide a proper bonding surface for finish coat. Exercise care to prevent damage to shop coat. Touch-up abraded or marred shop coats with paint used for priming or "universal primer" compatible with primer, topcoat, and field surface preparation.
3. Zinc Coated (Galvanized), and Aluminum Surfaces: Remove grease and oil with a cleaner recommended for the purpose. Treat and roughen surfaces using either mechanical or chemical means. When chemical compound is used rinse the chemical compound completely with clean, fresh water.

- D. Concrete and Masonry Surface Preparations:** Delay painting on concrete or masonry surfaces as long as practicable within the limits of the Contract. Test surfaces for presence of alkali and neutralize as required. Test surfaces for moisture content and do not paint surfaces which exceed manufacturer's printed instructions. Remove grease, oil, form release agents and efflorescence. Patch cracks and other blemishes to be covered by paint. Neutralize concrete surfaces which have received capillary waterproofing,

utilizing materials and methods as recommended by the manufacturer and applicator of the capillary waterproofing.

1. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled in accordance with manufacturer's instructions.
2. Block Fillers for Concrete Surfaces Scheduled to be Painted: After review by Architect and Structural Engineer, apply block fillers to selected concrete surfaces that have minor surface defects such as small air pockets, slight honeycombs, small blisters, small plastic shrinkage cracks and other type defects which in the opinion of the Architect and Structural Engineer have not resulted in any structural deficiency. Apply block filler at a rate to ensure complete coverage filled in accordance with manufacturer's instructions.

**E. Plaster Work, Surface Preparation**

1. Test plaster surfaces with a moisture meter and do not proceed with painting until the moisture content satisfies the recommendation of the respective paint manufacturer.
2. Remove grit and loose particles and repair surface irregularities before paint is applied. Repair cracks and holes with patching plaster, properly keyed to the existing plaster, and sandpaper smooth. Patching plaster must be compatible with finish paint system.
3. Prime plaster surfaces with an approved alkali-resistant primer. Spackle imperfections in the plaster that become visible after the prime coat is applied. Make flush with adjoining surface, and spot prime with the prime coat material. If the prime coat does not dry to a uniform sheen over the entire surface, the areas that indicate suction shall also be spot primed before applying succeeding coats.

**F. Gypsum Board and Fiberglass Reinforced Gypsum, Surface Preparation: Repair minor cracks and holes with finishing compound, and sand smooth after drying in accordance with recommendations of Gypsum Association.**

**G. Woodwork, Surface Preparation**

1. Sandpaper woodwork to remove roughness, loose edges, splinters or splinters and then brush to remove dust. Wash off grease or dirt with an approved cleaner.
2. Clean knots, pitch streaks or visible sap spots of residue and treat with two coats of "Formula WP-578 Knot Sealer" (Western Pine Association). Allow at least two hours between the application of the first and second coats. Prime millwork on all sides before installation. Treat surfaces of open-grained woods with paste filler. Thin paste filler to brushing consistency with turpentine and apply in two coats, with stiff, short-bristled brushes. Allow filler to dry for one hour, then rub surfaces across the grain with coarse burlap or pads of excelsior until the surplus filler is removed. After the primer or paste filler has dried, fill nail holes and other indentations with putty, flush with the adjacent surfaces. Sand wood surfaces smooth with No. 00 sandpaper and remove dust.

**H. Pipe Covering and Insulation, Surface Preparation: Clean surfaces of pipe, duct and equipment insulation (such as canvas jackets and troweled-on insulation), of loose,**

foreign and objectionable material prior to priming or sealing.

### 3.4 WORKMANSHIP

- A. General: Use applicator and techniques best suited for substrates and type of material being applied. Apply materials at not less than recommended spreading rate to establish a total dry film thickness as indicated or, if not indicated, as recommended.
- B. Mix materials thoroughly before application to produce a mixture of uniform density; strain if necessary, before using. Do not mix surface film into material. If necessary, remove surface film and re-strain material before using. Do not adulterate ready-mixed materials except in accordance with the manufacturer's printed instructions. If no printed instructions appear on the container, obtain this information in writing from the manufacturer. Use only approved thinners and only within recommended limits.
- C. Tinting: Tint each undercoat a lighter shade to facilitate identification of each coat where multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.
- D. Apply materials with care to a uniform and proper film thickness, showing no runs, holidays, sags, crawls or other defects. Apply with a minimum of brush marks. Finish surfaces shall be uniform in sheen, color and texture.
- E. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators as follows:
  - 1. Brushes: Use brushes best suited for the material applied.
  - 2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool for the material and texture required.
  - 3. Spray Equipment: Use airless spray equipment with orifice size for the material and texture required.
- F. The number of coats and the film thickness required are the same regardless of the application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. Sand between applications where sanding is required to produce a smooth even surface. Apply additional coats if undercoats, stains, or other conditions show through final coat of paint until paint film is of uniform finish, color, and appearance. Give special attention to ensure that surfaces, including edges, corners, crevices, welds, and exposed fasteners, receive a dry film thickness equivalent to that of flat surfaces.
- G. Apply two thin coats of paint to bare wood surfaces in sliding contact so as not to interfere with proper operation. Do not paint other materials in sliding contact. Remove paint applied to such surfaces.
- H. Paint access doors, plates, panel boxes, steel grilles, louvers, convector covers, registers, exposed prime painted hardware and the like in colors as selected. Paint back sides of access panels and removable or hinged covers to match exposed surfaces. Paint interior surfaces of ducts or piping where visible through registers or grilles with a flat, non-specular paint type appropriate to surface to be painted. Finish paint door tops, bottoms, and side edges the same as exterior faces. Do not paint nameplates on

equipment or over Underwriter's Laboratories, Factory Mutual or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

- I. Do not paint heating elements and pipes while they contain heat. Keep them cold until after the final coat has thoroughly dried.
- J. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces.
  - 1. Mechanical items to be painted include, but are not limited to uninsulated metal piping, uninsulated plastic piping, pipe hangers and supports, tanks that do not have factory-applied final finishes, visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets, duct, equipment, and pipe insulation having "all-service jacket" or other paintable jacket material, and mechanical equipment that is indicated to have a factory-primed finish for field painting.
  - 2. Electrical items to be painted include, but are not limited to, switchgear, panelboards and electrical equipment that is indicated to have a factory-primed finish for field painting.
- K. Allow coats to dry and cure thoroughly before succeeding coats are applied; allow a minimum of 24 hours between applications on any one surface unless otherwise specified by the manufacturer.
- L. Sandpaper undercoats on interior metal thoroughly and uniformly to provide a smooth, even surface for finish coats.
- M. Surfaces given a prime or body coat of paint under other sections of these specifications will not require such coats of paint under this specification section. Repair existing prime coatings with same primer or undercoat unless otherwise specified.
- N. Furnish competent technical assistance by the paint manufacturer on the job to ensure proper application of his material.
- O. When using paint with additional mildew inhibitive formulation, observe the procedures and precautions in the paint manufacturer's printed instructions for the use of this product.

### **3.5 CLEANING**

- A. At the end of each work day, remove empty cans, rags, rubbish, and other discarded paint materials from the site. Remove paint spots, oil or stains upon adjacent surfaces not requiring painting and leave entire job clean.
- B. Upon completion of painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping, using care not to scratch or damage adjacent finished surfaces.

### **3.6 PROTECTION**

- A. Place paint or solvent soaked rags, waste or other materials which might constitute a fire hazard in metal containers and remove from premises at the close of each day's work. Take every precaution to avoid damage by fire.



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- B. Provide suitable coverings to protect surfaces not requiring painting. Protect work of other trades, whether to be painted or not, against damage by painting operations. Correct damage by cleaning, repairing or replacing, and repainting, as required and acceptable to Owner.
- C. Remove or protect items such as hardware, hardware accessories, plates, lighting fixtures and similar items placed prior to painting. Reposition or remove protection upon completion of each space. Disconnect equipment adjacent to walls by workmen skilled in these trades to permit painting of wall surfaces; replace and reconnect after completion of painting.
- D. Maintain wrappings or other factory applied protection furnished with finish hardware (or other items provided by other trades) installed in areas where painting is required. If such protection is displaced or removed, replace before painting work continues and maintain for the duration of painting and coating work.
- E. Provide "wet paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others for protection of their work after completion of painting operations. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

**END OF SECTION**

**SECTION 09 96 00  
HIGH PERFORMANCE COATINGS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. General: Provide High Performance Coatings in accordance with requirements of the Contract Documents.
- B. Related Work Specified Elsewhere:
  - 1. Section 01 81 13 "Sustainable Design Requirements" for additional references, definitions, documentation requirements, action plans, meetings, and performance requirements of products and systems.
  - 2. Section 09 91 00 "Painting".

**1.2 REFERENCES**

- A. General: Comply with the applicable provisions of the referenced standards except as modified by governing codes and the Contract Documents. Where a recommendation or suggestion occurs in the referenced standards, such recommendation or suggestion shall be considered mandatory. In the event of conflict between referenced standards, this specification or within themselves, the more stringent standard or requirement shall govern.
- B. American Architectural Manufacturers Association (AAMA):
  - 1. AAMA 2603 "Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Extruded Aluminum and Panels".
  - 2. AAMA 2605 "Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Architectural Extrusions and Panels".
- C. ASTM International (ASTM):
  - 1. ASTM D523: "Test Method for Specular Gloss".
- D. Code of Federal Regulations: "40 CFR 59, Subpart D-2002: National Volatile Organic Compound Emission Standards for Architectural Coatings".
- E. The Society for Protective Coatings (SSPC)
  - 1. SSPC Volume 2 "Systems and Specifications".

**1.3 SUBMITTALS**

- A. General: Submit the following in conjunction with submittals required for substrates, specified in other Sections.



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- B. Product Data: Submit for Architect's action. Submit manufacturer's technical literature, specifications and application instructions describing the general properties of each material and accessory to be used in the Work.
- C. Samples: Submit for Architect's action.
  - 1. Provide in accordance with finish samples for the following Sections:
    - a. Section 05 70 00 "Decorative Metal"
    - b. Section 08 41 00 "Entrances and Storefronts"
    - c. All other Sections that reference this Section.
- D. Benchmark Samples
  - 1. Provide benchmark sample(s) consisting of full-coat benchmark finishes for each type of coating and substrate required after approval of paint samples designated by the Architect for final review.
  - 2. Label samples to indicate product, characteristics, and locations in the Work. Samples will be reviewed for color and appearance only.
- E. Quality Control Submittals: Submit for Architect's information.
  - 1. Certificates:
    - a. Document Review: Before commencing work, submit a written statement signed by the Applicator certifying that the Contract Documents, shop drawings and product data have been reviewed with material manufacturers' qualified technical representatives and that they agree the selected materials are proper, compatible with contiguous materials and adequate for the application shown.
    - b. Paint Manufacturer's Certification: Furnish certification signed by the primary manufacturer of the paint coating materials, stipulating which painting materials and systems are proposed for use in the Work, and stating that the coating applicator is approved as a qualified applicator of the specified coating systems.
    - c. Applicator Qualifications.

**1.4 QUALITY ASSURANCE**

- A. Qualified Applicators: The High performance coatings work shall be performed by firms having 5 years experience in the application of specified materials on comparable projects. The firms shall have been trained by and have the approval of the high performance coatings materials manufacturer. The applicators shall provide evidence of successful completion of work of similar scope to that shown and specified using similar high performance coatings.



- B. Sole Source Responsibility: Obtain each kind of high performance coating from one source of a single manufacturer. The manufacturer shall furnish evidence that the specified materials have been manufactured by the same source and successfully utilized on a yearly basis for a minimum of 5 years on projects of a similar scope to that shown and specified.
- C. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction, including VOC requirements for applicable Air Quality District. Obtain necessary approvals from authorities having jurisdiction.

## **1.5 WARRANTIES**

- A. Warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and are in addition to and run concurrent with other warranty requirements of the Contract Documents.
- B. Special Warranty, Resinous Coatings: Provide a written warranty, from the manufacturer (formulator) of resinous coating system and the finisher, for a period of 10 years, warranting against the loss of film integrity, chalking, fading, non-uniformity, corrosion and the overall performance of color of the resinous coatings. Upon notification of such defects, within the warranty period, make the necessary replacements at the convenience of the Owner.
  - 1. Color retention not to exceed 5 $\Delta$  E Units (Hunter) color change as calculated in accordance with ASTM D2244 on exposed surfaces cleaned with clean water and a soft cloth.
  - 2. Degree of chalking not to exceed rating No. 8 for colors and No. 6 for whites when measured in accordance with ASTM D4214 Test Method, Test Method A on exposed unwashed surfaces.

## **PART 2 - PRODUCTS**

### **2.1 HIGH PERFORMANCE RESINUOUS COATINGS**

- A. General: Finish designations shall be the same color and sheen, no matter the substrate or coating type.
- B. Color and Sheen: Match Architectures Sample
- C. Finishes:
  - 1. FIN-1: PPG, UC106714XL Vintage Bronze (Duranar)
  - 2. FIN-2: RAL 6008 (Match PT-13) with mica in final coat
- D. Resinous Coatings for Aluminum and Steel: Remove die markings prior to finishing operations. Where necessary to remove die markings from any part of the work, each member shall be finished by the same process, whether or not die markings exist. Perform this work in addition to the finish specified. Scratches, abrasions, dents and similar defects are unacceptable.



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1. Fluoropolymer PVDF Coating 3 Coat System appropriate for coastal areas:  
Standard 3-coat, thermocured system composed of specially formulated  
inhibitive primer, fluoropolymer color coat, and clear fluorocarbon topcoat  
complying with AAMA 2605 and AA- C12C42R1x in custom colors and gloss as  
selected, using 70% minimum polyvinylidene fluoride resin by weight either  
"Kynar 500" (Arkema, Inc.) or "Hylar 5000 Fluorocarbon Resin" (Solvay  
Polymers), applied to a total dry film thickness of 1.6 mils.
  - a. Color and Sheen: Match Architect's sample.
- E. High Performance Coating for existing metal components to be refinished. Clean metal  
thoroughly to be free of grease and debris. Abrade surface with steel wool removing all  
loose paint and foreign matter (SSPC SP3). Thoroughly and uniformly scarify by power  
sanding to dull substrate.
  - a. Prime Coat: V115 Uni-Bond (Tnemec)  
DFT 2.0-4.0 Mils
  - b. Finish Coats: Two Coats 1029 Enduratone (Tnemec)
  - c. Color and Sheen: Match FIN-1/FIN-2
  - d. Manufacturer:  
Tnemec Company Inc  
Tony Hobbs  
(310) 804-2326  
[thobbs@tnemec.com](mailto:thobbs@tnemec.com)

**2.2 HIGH PERFORMANCE COATINGS – EXTERIOR FERROUS METALS**

- A. General: Provide primer and finish paint as supplied by a single manufacturer for  
the entire project.
- B. System Type: Zinc/Epoxy/Fluoropolymer as specified or approved equal.  
Surface Preparation: SSPC-SP 11 Power Tool Clean to Bare Metal all welds and  
damaged organic zinc primer. One of the following systems, or approved equal:
  1. Tnemec Co. (Basis of Design)

Primer:	Series 90-97 TnemeZinc DFT 2.5 to 3.5 mils.
Spot Primer:	94-H20 Hydro-Zinc DFT 2.5 to 3.5 mils. Touch up all bare and exposed steel.
Intermediate Coat:	L69 Epoxoline DFT 2.0 to 4.0 mils.
Finish Coat:	1029 Enduraton DFT 2.0 to 3.0 mils.



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**2.3 HIGH PERFORMANCE COATINGS – INTERIOR FERROUS METALS**

- A. Interior High Performance Epoxy/Urethane Coatings
- B. System Type: Epoxy/Urethane as specified or approved equal.  
Surface Preparation: SSPC-SP 11 Power Tool Clean to Bare Metal all welds and damaged organic zinc primer. One of the following systems, or approved equal:
  - 1. Tnemec Co. (Basis of Design)  
  
Spot Primer: Tnemec L69 Epoxoline. DFT 2.0 to 4.0 mils.  
Intermediate Coat: Tnemec L69 Epoxoline. DFT 2.0 to 4.0 mils.  
Finish Coat: Tnemec 1095 Endura-Shield DFT 2.0 to 3.0 mils.
  - 2. PPG  
  
Primer: PPG Amerlock 400 or 2 Series DFT 4.0 to 8.0 mils.  
Intermediate Coat: PPG Amerlock 400 or 2 Series DFT 4.0 to 8.0 mils.  
Finish Coat: PPG Amershield VOC DFT 3.0 to 6.0 mils.

**2.4 FERROUS METALS FINISH SCHEDULE**

- A. PC-01 – Black, flat 25 +/- 5 “Tricorn Black” SW6258 (Sherwin Williams)

**2.5 SHOP APPLICATION**

- A. Resinous Coatings: Apply fluoropolymer PVDF coatings in the shop to pre-fabricated assemblies. Apply coatings in accordance with manufacturer’s recommendations. Use applicator and techniques best suited for substrates and type of material to be applied. Apply materials at not less than recommended spreading rate to establish a total dry film thickness as indicated or, if not indicated, as recommended.
- B. Apply materials with care to a uniform and proper film thickness, showing no runs, holidays, sags, crawls or other defects. Finish surfaces shall be uniform in sheen, color and texture.

**2.6 SOURCE QUALITY CONTROL**

- A. Contractor’s Quality Control Responsibilities: DB Contractor is responsible for quality control of the Work.
- B. Color Range: During production, maintain large size color range samples for use in comparing against production material. Mark and code extremes of the color range so that these are not adjacent to one another in the same plane.

**PART 3 – EXECUTION**

**3.1 GENERAL**

- A. Manufacturer’s Instructions: Prepare substrates, apply primers and apply the work of this Section in accordance with the manufacturer’s instructions, except where more stringent requirements are shown or specified, and where project conditions require extra precautions or provisions to ensure satisfactory performance of the Work.



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**3.2 EXAMINATION**

- A. Verification of Conditions: Examine the areas to receive the Work and the conditions under which the Work would be performed. Remedy conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

**3.3 PREPARATION**

- A. Substrate Acceptability: Commencement of installation shall constitute acceptance of substrate conditions by the Applicator.
- B. Ferrous Metals, Surface Preparation
  - 1. General: Clean bare metal surfaces thoroughly of foreign matter such as mortar, plaster, grease, rust, scale and dirt before priming coat is applied. Remove oil, grease and similar contaminants in accordance with SSPC SP-1 "Solvent Cleaning", prior to additional surface preparation specified. Remove rust and mill scale in accordance with SSPC SP-3 "Power Tool Cleaning". Where solder flux has been used, clean surface with solvent, or use mechanical tools to remove. Immediately after surface preparation, apply primer in accordance with manufacturer's instructions. Use painting methods which will result in full coverage and dry film thickness specified. After erection is completed, touch-up heads of bolts, welded surfaces and other field connections with specified primer.
  - 2. Shop Primed Ferrous Metal Surfaces: Remove grease and oil with a cleaner recommended for the purpose. For exterior exposed steel, follow cleaning by abrading all epoxy shop coated surfaces as recommended by manufacturer to provide a proper bonding surface for finish coat. Exercise care to prevent damage to shop coat. Touch-up abraded or marred shop coats with paint used for priming or "universal primer" compatible with primer, topcoat, and field surface preparation.

**3.4 FIELD QUALITY CONTROL**

- A. Contractor's Quality Control Responsibilities: DB Contractor is responsible for quality control of the Work.

**3.5 TOUCH-UP**

- A. Touch-Up to Fluoropolymer PVDF Coating System: Touch up damaged, scratched, marred or abraded exposed fluoropolymer resinous coated paint utilizing approved air dried fluoropolymer resinous paint system in matching colors and sheen. Obtain Architect's approval of finished touch-up.

**3.6 CLEANING**

- A. Upon completion of painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping, using care not to scratch or damage adjacent finished surfaces.

**END OF SECTION**

**SECTION 10 21 13  
TOILET COMPARTMENTS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. General: Provide toilet compartments in accordance with requirements of the Contract Documents.
- B. Related Work Specified Elsewhere
  - 1. Section 01 81 13 "Sustainable Design Requirements" for additional references, definitions, documentation requirements, action plans, meetings, and performance requirements of products and systems.
  - 2. Structural steel supports including drilling of supports for ceiling hung toilet partitions are specified in Section 05 50 00, "Metal Fabrications". Ceiling stud bolts are furnished under this Section and installed under Section 05 50 00, "Metal Fabrications".
  - 3. Wood blocking is specified in Section 06 10 00 "Rough Carpentry".
  - 4. Toilet accessories installed within toilet compartments are specified in Section 10 28 13 "Toilet Accessories".

**1.2 REFERENCES**

- A. General: Comply with the applicable provisions of the referenced standards except as modified by governing codes and the Contract Documents. Where a recommendation or suggestion occurs in the referenced standards, such recommendation or suggestion shall be considered mandatory. In the event of conflict between referenced standards, this specification or within themselves, the more stringent standard or requirement shall govern.
- B. American Architectural Manufacturers Association (AAMA)
  - 1. AAMA 2603 "Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Extruded Aluminum and Panels".
  - 2. AAMA 2604 "Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Architectural Extrusions and Panels".
- C. American Welding Society (AWS)
  - 1. AWS D1.1 "Structural Welding Code - Steel".
  - 2. AWS D1.3 "Structural Welding Code - Sheet Steel".
- D. National Association of Architectural Metal Manufacturers (NAAMM): NAAMM "Metal Finishes Manual".



## SECTION 10 21 13 TOILET COMPARTMENTS

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- E. Industrial Fasteners Institute (IFI): "Fastener Standards Book."

### 1.3 SYSTEM DESCRIPTION

- A. Performance Requirements: Provide continuous steel framing for ceiling hung toilet partition supports, coordinated with the ceiling hung toilet compartments and including provisions for partition anchorage as required to sustain imposed loads and to limit deflections to L/360 between hangers.

### 1.4 SUBMITTALS

- A. Product Data: Submit for Architect's action. Submit manufacturer's technical literature, specifications and installation instructions describing the general properties of each material and accessory to be used in the Work including catalog cuts of anchors, hardware, fastenings, and accessories.
- B. Shop Drawings: Submit for Architect's action. Submit shop drawings for the fabrication and installation of the Work. Prepare details at not less than 3 in. = 1 ft. (1:5) minimum scale showing layout, elevations, and dimensions of all panels, pilasters, and doors. Show cutouts and anchorage for other work as required. Show locations of reinforcement and cutouts for compartment-mounted toilet accessories coordinated with approved toilet accessory manufacturer and model number. Revise shop drawings to adjust to field measurements.
- C. Setting Drawings: Submit for Architect's information. Provide setting drawings and templates for the location of metal anchorage items that are to be embedded in or anchored to concrete, masonry or anchored to gypsum wallboard including location of partition reinforcing.
- D. Samples: Submit for Architect's action. Label samples to indicate product, characteristics, and location in the Work. Samples will be reviewed for color and appearance only. Furnish sufficient samples to establish the full range of colors and textures for materials exposed in the finished work. Compliance with other requirements is the responsibility of the Contractor. Provide the following:
1. Metal Finishes: Sample of each type of color and finish required for units, prepared on 6 in. (150 mm) square of same gauge, alloy, thickness and material indicated to be used in the final Work. Architect's acceptance will be for color and texture of finish only.
  2. Hardware: One of each.
- E. Quality Control Submittals: Submit for Architect's information.
1. Certifications
    - a. Document Review: Before commencing work, submit a written statement signed by the Contractor and the Installer certifying that the Contract Documents, shop drawings and product data have been reviewed with material manufacturers' qualified technical representatives and that they agree the selected materials are proper, compatible with contiguous materials and adequate for the application shown.
  2. Installer's Qualifications: Evidence of successful completion of work of similar

scope to that shown and specified for this Project.

3. Manufacturer's Qualifications: Evidence that the specified materials have been manufactured by the same source and successfully utilized for a minimum of 5 years on projects of a similar scope to that shown and specified for this Project.

#### **1.5 QUALITY ASSURANCE**

- A. Single-Source Responsibility: Obtain toilet compartment from one source of a single manufacturer. Obtain accessory products used in conjunction with toilet compartment from the toilet compartment manufacturer or from sources acceptable to the toilet compartment manufacturer.
- B. Qualified Installer: The toilet compartment work shall be performed by an installer having 5 years experience in the installation of specified materials on comparable projects. The installer shall have the approval of the toilet compartment materials manufacturer.
- C. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from authorities having jurisdiction.
- D. Size Variations: Obtain Architect's acceptance of manufacturer's standard size units, which may vary slightly from sizes indicated.

#### **1.6 DELIVERY, STORAGE AND HANDLING**

- A. Deliver partition units fully identified for installation complete with fastenings and accessories and protected from damage from any source.
- B. Protect units from damage during transit, storage and installation. Tool marks, rust, blemishes and any other damage on exposed surfaces will not be acceptable. Store material indoors in a dry location, off the ground.
- C. Protect units during construction period so that they will be without any indication of deterioration, use or damage at time of substantial completion.

#### **1.7 WARRANTIES**

- A. Warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and are in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.
- B. Special Warranty, Powder Coated Finish: Provide a written Warranty for a period of three (3) years, addressed to the Owner and assignable to all future Owners within this warranty period warranting that the powder coated finish will not fade, stain or discolor excessively or to a non-uniform appearance, and will not corrode, crack, craze, peel, or deteriorate. Upon notification of such defects, within the warranty period, make the necessary replacements at the convenience of the Owner.



## SECTION 10 21 13 TOILET COMPARTMENTS

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### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Provide compartments of types shown, per manufacturer's specifications except as modified herein; manufactured by one of the following:
  - 1. Ceiling Hung Compartments
    - a. "Empire" (Knickerbocker Partition Corporation).
    - b. "Forum CH-700" (Metpar Corp.).
  - 1. Wall Hung Wedge Type Urinal Screen
    - a. "WV" (Knickerbocker Partition Corporation).
    - b. "Type T Urinal Screen" (Metpar Corp.).
    - c. "Type F Urinal Screen" (Sanymetal Products Co., Inc.).

#### 2.2 MATERIALS

- A. General: Provide materials which have been selected for surface flatness and smoothness. Exposed surfaces which exhibit pitting, seam marks, oil canning, distortions, rollermarks, stains, discolorations, or other imperfections on finished units are not acceptable.
- B. Sheet Steel for Baked Enamel and Powder Coated Finish: ASTM A591 electrolytically zinc coated or ASTM A653 hot dipped galvanized or galvanized commercial steel sheet for exposed applications, bonderized, stretcher leveled. Minimum base metal gauges (uncoated) as follows:
  - 1. Doors: 22 gauge (0.75mm).
  - 2. Panels: 20 gauge (0.9mm).
  - 3. Pilasters: 18 gauge (1.2mm).
  - 4. Concealed Reinforcement: 14 gauge (1.9mm) for tapping, 12 gauge (2.7mm) for anchoring devices.
  - 5. Edge Moldings: 20 gauge (0.9mm).
  - 6. Urinal Screens: 20 gauge (0.9mm).
- C. Brackets: Stainless steel cast shapes.
- D. Pilaster Shoes: Stainless steel sheet, minimum 20 gauge (0.95mm), formed to manufacturer's standard design, not less than 3 in. (75mm) high.
- E. Core Filler: Manufacturer's standard rot-proof and vermin-proof, resin impregnated sound deadened, corrugated or honeycomb type core material.





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- F. Adhesive: Manufacturer recommended adhesive.

### 2.3 HARDWARE

- A. Hardware: Provide manufacturer's standard-heavy duty operating hardware and accessories fabricated from Type 304 stainless steel. All stainless steel hardware shall receive a #4 satin finish and shall match each other.
1. Hinges: Manufacturer's standard cutout inset type, gravity type or spring tension cam type hinges, fully adjustable to bring door to rest in any position, with all moving parts self-lubricating.
  2. Latches: Manufacturer's ADA approved slide latch concealed mounting unit, with rubber bumper on keeper designed for emergency access, one unit required on each door at mid-point.
  3. Door Pulls: Manufacturer's standard unit for outswinging doors with privacy indicator at ADA stalls.
  4. Bumpers: Manufacturer's standard for outswinging doors.
  5. Combination Coat Hook and Bumper: Manufacturer's standard hook and pin with rubber bumper, one unit required on each door, mounted 3 in. (75mm) from top at center of door, except as otherwise shown.

### 2.4 FASTENERS, ANCHORAGE, REINFORCEMENT AND SUPPORTS

- A. Fastening Devices: Stainless steel or brass machine screws, sex bolts and stud bolts with exposed finish to match hardware. Use manufacturer's standard fastening devices except use only 1-way or spanner type heads and nuts for exposed screws and bolts.
- B. Concealed Anchorage Reinforcement: Minimum 12 gauge (2.8mm) galvanized steel sheet. All concealed anchorage reinforcement required for hardware, accessories fittings, toilet accessories and similar systems shall be installed in the shop.
- C. Concealed Tapping Reinforcement: Minimum 14 gauge (2mm) galvanized steel sheet. All concealed tapping reinforcement required shall be installed in the shop.
- D. Structural Supports for Ceiling Hung Partition System
1. Structural Steel Shapes, Plates and Bars: ASTM A36.
  2. Modular Structural Framing System: ASTM A569; modular, structural quality steel pre-formed "U" channel framing system with continuous open slot prepared to receive attachment nuts, bolts, straps, threaded rods, beam clamps, hanger rods support brackets and other accessories. Provide manufacturers standard corrosion resistant finish. Provide one of the following:
    - b. "Unistrut" (Unistrut Corp.).
    - c. "Power-Strut" (Allied Support Systems).
- E. Overhead Bracing for Overhead Braced Floor Supported Compartments: Continuous extruded aluminum, anti-grip profile, with clear anodized finish.



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### 2.5 FABRICATION

- A. General: Fabricate work with flat and smooth surfaces free of waves, warps, buckles, rough areas, and voids. Provide internally welded reinforcements and cutouts required for attaching anchoring devices, fittings, hardware and toilet accessories.
- B. Panels
  - 1. General: 1 in. (25mm) thick; fabricate from two steel faceplates; assemble over and cement under pressure to core filler with waterproof thermosetting adhesive.
  - 2. Edges: Fasten, seal and interlock formed edges with manufacturer's standard design edge molding to conceal faceplate edges; miter corners, weld and grind smooth.
  - 3. Anchorages
    - b. Ceiling Hung Compartments: Furnish galvanized steel anchorage devices, complete with threaded rods, lock washers, and leveling adjustment nuts at pilasters, to permit connection to structural support above finished ceiling. Furnish devices which are designed to support pilasters from structure without transmitting load to ceiling finish. Furnish 3 in. (75mm) high stainless steel shoe, finished to match hardware, at each pilaster.
    - c. Wall Supported Compartments: Fabricate divider panels of two steel sheets with internal reinforcing to form unit which is "V" shaped in plan, approximately 6 in. (150mm) wide at wall and tapering to approximately 1 in. (25mm) at pilaster. Furnish complete with anchorages and supporting framework for installation in other work. Furnish anchorage system with mechanical adjustment for leveling panel laterally and vertically.
- C. Doors: 1 in. (25mm) thick; fabricate as specified for panels. Strengthen doors against torsional stresses by tack or spot welding faceplates together under edge moldings or plug welding faceplate edges through edge molding; space welds not over 18 in. (450mm) apart. Make doors 24 in. (600mm) wide, unless otherwise shown. Unless otherwise shown, furnish 24 in. (600mm) wide inswinging doors for ordinary toilet stalls and 32 in. (800mm) wide (clear opening) outswinging doors at disabled access stalls.
- D. Pilasters: 1-1/4 in. (31mm) thick; same construction as specified for doors. Provide each connecting end with an anchoring device consisting of a reinforced galvanized steel cross-bar internally welded to faceplates. Device to provide adjustment for leveling, plumbing and tightening of installation.
- E. Urinal Screens
  - 1. Wall Hung, Wedge Type: Provided with top and bottom cap, locking strip and 4 in. (100mm) wide wedge at wall surface. Mounted with concealed mounting plate with no exposed fasteners.
- F. Drilling and Tapping



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1. General: Provide factory drilling to receive fittings, hardware and other accessories attached to toilet compartments; tap holes for machine screw fastenings.
2. Toilet Accessories: Obtain templates to drill holes to receive toilet accessories: templates furnished to partition manufacturer under Section 10 28 13 "Toilet Accessories". All cutting, drilling, tapping and internal reinforcement required for partition mounted toilet accessories shall be performed in the shop. No field cutting of toilet compartments will be permitted, unless approved by the manufacturer and the Architect.

### 2.6 FINISHES

- A. Sheet Steel; Baked Enamel and Powder Coat Finish Preparation: Clean, degrease and sand exposed surfaces smooth. Prepare galvanized surfaces in accordance with paint manufacturer's written instructions.
- B. Baked Enamel or Powder Coat Finish: Factory-finish with one coat of baked on, rust inhibitive, synthetic primer followed by one or more coats of thermosetting low gloss synthetic polyester or acrylic urethane baked enamel or hybrid epoxy/polyester powder coat; apply electrostatically to a minimum total thickness of 1.5 mils (38 $\mu$ m); oven bake in excess of 275 deg. F. (135 deg. C) for length of time necessary for polymerization to produce a uniform, smooth, lustrous protective finish.
- C. Aluminum: Clear anodized high luster finish.
- D. Color Selection
  1. Standard: One color or combinations of 2 colors as selected from manufacturer's standard color chart.
- E. Stainless Steel:
  1. AISI No. 4 satin finish. Apply finished exposed stainless steel with texture aligned in same direction for all components.
- F. Other Exposed Metal for Hardware: US26 polished chromium finish.

### 2.7 PAINT AND COATING MATERIALS

- A. Interior Ferrous Metal Primer: Compatible with the finish coats of paint; shop apply primer to the respective dry film mil thickness specified or as recommended by the manufacturer; one of the following:
  1. "Carbocoat 115" (Carboline Co.); 1.5 - 2.0 mils (38 $\mu$ m to 50 $\mu$ m) d.f.t.
  2. "Interprime 298" (International Paint), 3.0-4.0 mils (75 $\mu$ m -100 $\mu$ m) min d.f.t.
  3. "Amercoat 5105" (PPG); 2.0 - 3.0 mils (50 $\mu$ m -75 $\mu$ m) d.f.t.
  4. "Series V10" (Tnemec Co. Inc.); 2.0 - 3.5 mils (50 $\mu$ m -80 $\mu$ m) d.f.t.
- B. Dielectric Separator: Cold applied, asphalt emulsion type complying with ASTM D1187, non-sagging, resistant to severe corrosion conditions; applied in two coats for an overall



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minimum dry film thickness of 25 mils (635 $\mu$ m) or heavy coating of epoxy paint in minimum 2.0 mil (50  $\mu$ m) dry film thickness.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Verification of Conditions: Examine the areas to receive the Work and the conditions under which the Work would be performed. Remedy conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.
- B. Coordination: Furnish inserts and anchorages which must be built into other work for installation of toilet compartments and related work; coordinate delivery with other work to avoid delay.

#### 3.2 PREPARATION

- A. Substrate Acceptability: Inspect areas and accept surfaces designated to receive toilet compartments, as satisfactory for the reception of the Work specified in this Section. Commencement of installation shall constitute acceptance of substrate conditions by the Installer

#### 3.3 INSTALLATION

- A. Verify all measurements and dimensions at the Project site and coordinate the Work with the work of other trades. Allow for adjustments within specified clearances where ever taking field measurements before fabrication might delay work. Erect work rigidly; straight, plumb and level. Conceal field drilling, cutting and fitting into the finished work. Adjust hardware for proper operation and leave in good working condition.
- B. Framing For Ceiling Hung Toilet Compartments
  - 1. Provide steel rods, 1/2 in. (13mm) dia., spaced not more than 36 in. (900mm) o.c. Thread rods to receive anchor and stop nuts. Fit hangers with wedge shape washers for full bearing on sloping flanges of support beam.
  - 2. For support of ceiling hung compartments in earthquake zones comply with manufacturer's seismic bracing specifications and local code earthquake requirements for design and installation of side braced channel supports. Brace the framing system in both directions using channel hangers for stability and to comply with loading requirements including uplift in earthquake zones. Refer to drawings for details.
  - 3. Coordinate installation with toilet partition manufacturer's written instructions and recommendations.
  - 4. Comply with manufacturer's recommended procedures and installation sequence. Install compartments rigid, straight, plumb, and level. Locate wall brackets so that holes for wall anchorages occur in masonry or tile joints. Secure panels to pilasters with not less than two stirrup brackets located to align with stirrup brackets at wall. Secure panels in position with manufacturer's recommended anchoring devices.



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- C. Pilasters
1. General: Fasten each pilaster directly to structure or an anchor plate with 2 stud bolts integrally welded thereto per manufacturer's recommendations. Rigidly secure pilasters to stud bolts by means of the anchoring device with face washers and leveling nuts so as to transmit strain of lateral thrust and pull to structure.
  2. Pilasters Adjacent to Walls: Install as specified hereinbefore; provide with one stud bolt. Fasten each pilaster to walls at same number of points specified for panels. Provide single-wing type brackets; align with panel brackets; secure each bracket to walls with 2 bolts of appropriate type and secure pilasters to each bracket with one sex bolt. Clearance between pilasters and walls shall be 1/2 in. (13mm) maximum.
  3. Pilaster Shoes: Conceal pilaster anchors with a pilaster shoe secured by concealed clips or machine screws.
- D. Panels: Fasten to walls and pilasters at not less than 2 points. Provide U-type brackets for fastening to pilasters and double-wing type brackets for fastening to walls. Secure each bracket to pilasters with 2 machine screws, to walls with 2 bolts of appropriate type; secure panels to each bracket with one sex bolt. Clearance between panels and pilasters shall be 1/2 in. (13mm) maximum; between panels and walls shall be between 1/2 in. (13mm) and 1 in. (25mm) maximum.
- E. Doors: Hang doors on hinges, located per manufacturer's standard, with working parts concealed in door. Set compartment door hinges to bring door to rest at approximately 30 deg. position from closed position when unlatched. Set hinges on outswinging doors (and entrance swing doors) to return to fully closed position. Coordinate location of bumpers on outswinging doors with counters, partition or other obstructions.
- F. Urinal Screens
1. Wall Hung; Bracket Supported Type: Fasten to walls at not less than two points with extra heavy double-wing type brackets. Provide clearance and secure to walls as specified for panels.
  2. Floor Supported Types: Fasten to floor with anchoring devices as specified for pilasters and to walls with same number of double-wing type brackets as specified for panels.

### 3.4 ADJUSTMENT

- A. Adjust and lubricate hardware for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors [and doors in entrance screens] to return doors to fully closed position.

### 3.5 CLEANING

- A. Clean surfaces and leave free from smears. Repair minor scratches and other finish imperfections. Replace damaged work. Provide protection as necessary to prevent damage during remainder of construction period.

**END OF SECTION**

**SECTION 10 28 13  
TOILET ACCESSORIES**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. General: Provide toilet accessories in accordance with requirements of the Contract Documents.
- B. Related Work Specified Elsewhere:
  - 1. Section 01 81 13 "Sustainable Design Requirements" for additional references, definitions, documentation requirements, action plans, meetings, and performance requirements of products and systems.
  - 2. Wood blocking is specified in Section 06 10 00 "Rough Carpentry".
  - 3. Mirrors not designated as toilet accessories are specified in Section 08 80 00 "Glazing".
  - 4. Drilled holes and cutouts to receive toilet accessories mounted on toilet partitions as provided under Section 10 21 13 "Toilet Compartments".
  - 5. Combination coat hooks and door bumpers mounted on toilet partitions are specified in Section 10 21 13 "Toilet Compartments".
  - 6. Electrical connections to power sources are specified in applicable Division 26 Electrical specification sections.

**1.2 REFERENCES**

- A. General: Comply with the applicable provisions of the referenced standards except as modified by governing codes and the Contract Documents. Where a recommendation or suggestion occurs in the referenced standards, such recommendation or suggestion shall be considered mandatory. In the event of conflict between referenced standards, this specification or within themselves, the more stringent standard or requirement shall govern.
- B. Industrial Fasteners Institute (IFI): "Fastener Standards Book".
- C. National Association of Architectural Metal Manufacturers (NAAMM): NAAMM "Metal Finishes Manual".
- D. National Electrical Manufacturers Association (NEMA).
  - 1. NEMA ICS 1: Industrial Control and Systems General Requirements
  - 2. NEMA MG 1(Revision No. 2): Motors and Generators
- E. The U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1 as applicable.

**1.3 SUBMITTALS**

- A. Product Data: Submit for Architect's action. Submit manufacturer's technical literature, specifications and installation instructions describing the general properties of each material and accessory to be used in the Work.
- B. Setting Drawings: Submit for Architect's action. Submit setting drawings for toilet accessory cutouts required in other work; include templates, substrate preparation instructions, and directions for preparing cutouts and installing anchoring devices.
- C. Schedule: Submit for Architect's action. Submit a toilet accessory schedule indicating types, quantities, sizes and installation locations by room for each toilet accessory item specified. Use designations indicated in the Schedule of Accessories specified herein and room designations indicated on Drawings in product schedule.
- D. Quality Control Submittals: Submit for Architect's information.
  - 1. Installer's Qualifications: Evidence of successful completion of work of similar scope to that shown and specified for this Project.
  - 2. Manufacturer's Qualifications: Evidence that the specified materials have been manufactured by the same source and successfully utilized for a minimum of 5 years on projects of a similar scope to that shown and specified for this Project.
- E. Closeout Submittals: Submit for Owner's documentation.
  - 1. Warranties: Special warranties as specified.
  - 2. Maintenance Data: Manufacturer's operating and maintenance manuals, including parts lists for the toilet accessories.

**1.4 QUALITY ASSURANCE**

- A. Qualified Installer: The toilet accessory installation work shall be performed by an installer having 5 years experience in the installation of specified materials on comparable projects.
- B. Single-Source Responsibility: Obtain toilet accessories from one source of a single manufacturer. Obtain accessory products used in conjunction with toilet accessory from the toilet accessory manufacturer or from sources acceptable to the manufacturer.
- C. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from authorities having jurisdiction.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

**1.5 DELIVERY, STORAGE AND HANDLING**

- A. Packing, Shipping, Handling, and Unloading: Pack, ship and handle components in accordance with manufacturer's instructions. Protect toilet accessories during transit,



## SECTION 10 28 13 TOILET ACCESSORIES

## DIVISION 10

delivery, storage, and handling to prevent damage, soilage, and deterioration. Cover and keep covered with non-staining protective wrapping. Do not deliver accessories until operations that could damage, soil, or deteriorate panels have been completed in installation areas.

- B. Storage of Materials: Store materials in unopened containers. Store off the ground and under cover, protected from damage by the elements.

### 1.6 WARRANTIES

- A. General: Warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and are in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.
- B. Special Warranty: Provide a written warranty, for a period of five (5) years, addressed to the Owner and assignable to all future Owners within this warranty period, for toilet accessory mirrors against visible silver spoilage defects. Upon notification of such defects, make necessary replacements at the convenience of the Owner.
- C. Special Warranty, Electric Hand Dryers: Provide a written warranty for a period of ten (10) years addressed to the Owner and assignable to all future Owners within this warranty period, for the electric hand dryers against defects. Upon notification of such defects, make necessary replacements at the convenience of the Owner.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Stainless Steel: ASTM A240\A240M; Provide the most suitable austenitic alloy, form and finish required to produce the Work. Provide Type 304 or Type 316 and low carbon Type 304L or 316L for components to be welded .03 in. (0.8 mm) minimum nominal thickness with No. 4 finish, for all toilet accessories unless otherwise specified.
- B. Brass
  - 1. Leaded and Unleaded Flat Products: ASTM B19.
  - 2. Rods, Shapes, Forgings and Flat Products with Finished Edges: ASTM B16\B16M.
  - 3. Castings: ASTM B30.
- C. Sheet Steel: ASTM A1008\A1008M, Designation CS (cold rolled, commercial quality steel), 0.04 in. (0.9mm) minimum nominal thickness unless otherwise shown or specified, surface preparation and metal pretreatment as required for applied finish.
- D. Galvanized Sheet Steel: ASTM A653\A653M, with Grade G60 hot dipped coating.
- E. Chrome Plating: ASTM B456, Service Condition No. SC2; US26D finish. On brass, nickel coating applied either directly to the base metal or over a coating of copper. On steel, nickel coating applied over a coating of copper.
- F. Mirrors: ASTM C1036, Type 1, Class 1, Quality q<sup>1</sup>, 1/4 in. (6mm) thick unless otherwise



specified. Mirrors shall have a uniform coating of silver, protected by a film of electrolytically deposited copper and a protective organic coating.

- G. Galvanized Steel Mounting Devices: ASTM A153\A153M, hot dip galvanized after fabrication.
- H. Fastening Devices: Stainless steel or cadmium plated steel, concealed in the finished work wherever possible. Exposed screws shall be theftproof, flat head, countersunk, finished to match the accessory where exposed. Furnish two (2) special tools per floor.
- I. All Other Materials: Manufacturer's standard for the items required or type best suited for the intended use.

## **2.2 FABRICATION**

- A. Recessed Units: Except where otherwise shown, fabricate units of all welded construction, without mitered corners. Hang doors or access panels with full length stainless steel piano hinge. Provide fasteners and anchorage that are fully concealed when unit is in the closed position.
- B. Surface Mounted Units: Except where otherwise shown, fabricate units with tight seams and joints and all edges rolled. Hang doors or access panels with full length stainless steel piano hinge. Provide fasteners and anchorage that are fully concealed when unit is in the closed position.
- C. Manufacturer's nameplates on exposed faces of units will not be permitted. Provide identification of each accessory item indicating manufacturer's name and product model number either on the back of the accessory or on a surface not exposed to view utilizing printed, waterproof label or stamped nameplate indicating manufacturer's name and product model number.
- D. Keys: Unless otherwise indicated, provide universal keys for access to toilet accessory units requiring internal access for servicing, resupply, etc. Provide minimum of six (6) keys to Owner's representative and obtain receipt.

## **2.3 MANUFACTURER**

- A. Specified proprietary designations are from the current catalog of Bobrick Washroom Equipment, Inc., unless otherwise specified, and establish the minimum standards of design, dimension and quality. Accessories manufactured by others will be considered, provided they satisfy the established requirements.

## **2.4 SCHEDULE OF ACCESSORIES**

- A. General: Provide products of the same manufacturer for each type of accessory unit and for units exposed in the same areas, unless otherwise acceptable to the Architect.
- B. SEE SCHEDULE ON A003.

## **PART 3 - EXECUTION**

### **3.1 GENERAL**

- A. Manufacturer's Instructions: Prepare substrates and install the work of this Section,

including components and accessories in accordance with the manufacturer's instructions, except where more stringent requirements are shown or specified, and where project conditions require extra precautions or provisions to ensure satisfactory performance of the Work.

### **3.2 EXAMINATION**

- A. Verification of Conditions: Examine the areas to receive the Work and the conditions under which the Work would be performed. Verify blocking has been installed properly. Verify location does not interfere with door swings or use of fixtures. Remedy conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

### **3.3 PREPARATION**

- A. Substrate Acceptability: Inspect areas and accept surfaces designated to receive toilet accessories, as satisfactory for the reception of the Work specified in this Section. Commencement of installation shall constitute acceptance of substrate conditions by the Installer.
- B. Verify all measurements and dimensions at the Project site and coordinate the Work with the work of other trades. Where toilet accessories are scheduled for installation on metal toilet partitions or gypsum board partitions, verify that concealed reinforcing is accurately and securely located.

### **3.4 COORDINATION**

- A. Coordinate toilet accessory locations, installation, and sequencing with other work to avoid interference with and ensure proper installation, operation, adjustment, cleaning, and servicing of toilet accessory items.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

### **3.5 INSTALLATION**

- A. Templates and Instructions: Furnish templates of accessories for drilling, tapping and cutouts. Furnish directions for preparing cutouts, installation of anchorage devices, substrate preparations and any other installation information required for work by other trades.
- B. Install accessories where shown, in accordance with manufacturer's written instructions. Utilize fasteners suitable for the substrate; rigidly secured and in accurate alignment with other fixtures. Provide concealed reinforcement and anchor plates as required to support units. Install accessories plumb and level.
- C. Do not through bolt toilet accessories mounted on toilet partitions. Drill and tap partition reinforcement for accessory bolts.

### **3.6 ADJUSTMENT AND CLEANING**

- A. After review of the installation by the Owner, remove protection, labels, smears and stains. Clean and polish each accessory in accordance with manufacturer's written recommendations and instructions.



**SECTION 10 28 13  
TOILET ACCESSORIES**

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- B. Adjust accessories for proper operation and verify that mechanisms function smoothly.  
Replace damaged or defective items.

**END OF SECTION**

**SECTION 10 44 00  
FIRE PROTECTION SPECIALTIES**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. General: Provide fire protection specialties in accordance with requirements of the Contract Documents.
- B. Related Work Specified Elsewhere:
  - 1. Section 01 81 13 "Sustainable Design Requirements" for additional references, definitions, documentation requirements, action plans, meetings, and performance requirements of products and systems.

**1.2 REFERENCES**

- A. General: Comply with the applicable provisions of the referenced standards except as modified by governing codes and the Contract Documents. Where a recommendation or suggestion occurs in the referenced standards, such recommendation or suggestion shall be considered mandatory. In the event of conflict between referenced standards, this specification or within themselves, the more stringent standard or requirement shall govern.
- B. ASTM E814 "Standard Test Method for Fire Tests of Through-Penetration Fire Stops".

**1.3 SUBMITTALS**

- A. Product Data: Submit for Architect's action. Submit manufacturer's technical literature and installation instructions describing the general properties of each material and accessory to be used in the Work.
  - 1. Fire Extinguishers: Include rating and classification.
  - 2. Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
- B. Closeout Submittals: Submit for Owner's documentation.
  - 1. Special Warranty: As specified.
  - 2. Maintenance Data: For fire extinguishers.

**1.4 QUALITY ASSURANCE**

- A. Single-Source Responsibility: Obtain fire extinguishers and fire-protection cabinets through one source from a single manufacturer.
- B. Qualified Installer: The fire protection specialties work shall be performed by an installer having 5 years experience in the installation of specified materials on comparable projects.
- C. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having



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FIRE PROTECTION  
SPECIALTIES**

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jurisdiction. Obtain necessary approvals from authorities having jurisdiction.

- D. NFPA compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers".
- E. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
  - 1. Provide fire extinguishers approved, listed, and labeled by FMG.
- F. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements of ASTM E 814 for fire-resistance rating of walls where they are installed.

**1.5 COORDINATION**

- A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

**1.6 DELIVERY, STORAGE AND HANDLING**

- A. Delivery: Do not deliver or install extinguishers until just before Substantial Completion.
- B. Protection: Do not use permanent fire extinguishers for construction period fire protection.

**1.7 WARRANTIES**

- A. General: Warranties and guaranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and are in addition to and run concurrent with other warranties and guaranties made by the Contractor under requirements of the Contract Documents.
- B. Special Warranty: Submit for Owner's documentation. Furnish a written warranty, for a 6 year period, in a form stipulated by the Architect, signed by the Contractor manufacturer and installer, against the fire extinguisher, cabinets and accessories from defects in materials or workmanship. Upon notification of such defects, within the warranty period, make the necessary repairs and replacements, at the convenience of the Owner. Other guarantees or warranties may not be substituted by the Contractor for the terms of this special warranty.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. General: Larsens, J.L. Industries, Potter-Roemer, or equal.

**2.2 FIRE EXTINGUISHERS**

- A. Type: Multipurpose dry chemical (ammonium phosphate). Stored pressure type.
- B. Rating: 3A:40B:C.

**2.3 CABINETS AND ACCESSORIES**

- A. General: Provide fire rated cabinets as required.



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- B. Fully Recessed Fire Extinguisher Cabinet, FEC-01:
1. Product: "Architectural Series Vertical Duo" (Larsen's).
  2. Inside Dimensions: Coordinate size with specified fire extinguisher.
  3. Style: Fully recessed mounting, with trim concealed by door.
  4. Single Flat Door: Steel sheet.
    - a. Narrow Vertical Glazing Panel: 1/4 inch wired glass.
    - b. Door Material: Bronze
  5. Box: Steel sheet.
  6. Hardware:
    - a. Self-adjusting roller catch.
    - b. Door Handle: Satin finish.
    - c. Hinges: Concealed type; allow full 180 degree opening of door.
    - d. Provide wall bracket for extinguisher, inside cabinet.
  7. Finishes: [Factory powder coated in custom color as selected by Architect.][Brushed No. 4 finish.]
  8. Graphics: [Provide engraved lettering with contrasting color powder coat finish in orientation and color as selected by Architect.]
- C. Surface Mounted Fire Extinguisher Cabinet, FEC-02:
1. General: Same as Fully Recessed Fire Extinguisher Cabinet, except as follows:
  2. Style: Surface mounted with stainless steel returns on four sides to wall.

**PART 3 - EXECUTION**

**3.1 GENERAL**

- A. Manufacturer's Instructions: Prepare substrates and install the work of this Section, including accessories, in accordance with the manufacturer's instructions, except where more stringent requirements are shown or specified, and where project conditions require extra precautions or provisions to ensure satisfactory performance of the Work.

**3.2 COORDINATION**

- A. Ensure that rated fire extinguisher cabinets match wall fire ratings where installed.
- B. Coordinate sizes of fire extinguisher with local authority having jurisdiction.



**SECTION 10 44 00  
FIRE PROTECTION  
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- C. Coordinate wall openings with wall framing.

**3.3 EXAMINATION**

- A. Verification of Conditions: Examine the areas to receive the Work and the conditions under which the Work would be performed. Remedy conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

**3.4 PREPARATION**

- A. Substrate Acceptability: Commencement of installation shall constitute acceptance of substrate conditions by the Installer.
- B. Fire-Rated Partitions: Prepare recesses in fire-rated partitions as required to maintain fire-separation integrity of partition.

**3.5 INSTALLATION**

- A. Substantial Completion: Determine date of Substantial Completion of Work. Inspect, charge, and tag fire extinguishers within 10 days before Substantial Completion date.
- B. Fire Protection Cabinets: Fasten fire-protection cabinets to structure, square and plumb.
  - 1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is not adequate for recessed cabinets, provide semi-recessed fire-protection cabinets.
  - 2. Provide inside latch and lock for break-glass panels.
  - 3. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.
- C. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

**3.6 ADJUSTING AND CLEANING**

- A. Remove temporary protective coverings and strippable films, if any, as fire-protection specialties are installed, unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces.
- D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance.
- E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

**END OF SECTION**

**SECTION 12 93 00  
SITE FURNISHINGS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. General: Provide site furnishings in accordance with requirements of the Contract Documents.
- B. Related Work Specified Elsewhere
  - 1. Bicycle racks are specified under Section 05 50 00 "Metal Fabrications".

**1.2 REFERENCES**

- A. General: Comply with the applicable provisions of the referenced standards except as modified by governing codes and the Contract Documents. Where a recommendation or suggestion occurs in the referenced standards, recommendation or suggestion shall be considered mandatory. In the event of conflict between referenced standards, this specification or within themselves, the more stringent standard or requirement shall govern.
- B. American Welding Society (AWS)
  - 1. AWS D1.1 "Structural Welding Code - Steel".
  - 2. AWS D1.2 "Structural Welding Code - Aluminum".
  - 3. AWS D1.3 "Structural Welding Code - Sheet Steel".
- C. Industrial Fasteners Institute (IFI): "Fastener Standards Book."
- D. National Association of Metal Manufacturers (NAAMM): NAAMM "Metal Finishes Manual".

**1.3 SUBMITTALS**

- A. Product Data: Submit for Architect's action. Submit manufacturer's technical literature, specifications and installation instructions describing the general properties of each material and accessory to be used in the Work.
- B. Setting Drawings: Submit for Architect's information. Provide setting drawings and templates for the location of site furnishings items that are to be embedded in or anchored to concrete.
- C. Product Schedule: Submit for Architect's action. Provide a product schedule for site furnishings. Use same designations indicated on Drawings.
- D. Samples: Submit for Architect's action. Label samples to indicate product, characteristics, and location in the Work. Samples will be reviewed for color and appearance only. Furnish sufficient samples to establish the full range of colors and textures for materials exposed in the finished work. Compliance with other requirements is the responsibility of the Contractor. Submit samples of each of the following items:



1. Each finish of each metal on the gage and alloy to be used in the final work, 3 in. (75mm) x 4 in. (100mm).
  2. Typical welded corner and butt joints.
  3. Other specified items as requested
- E. Quality Control Submittals: Submit for Architect's information.
1. Certificates:
    - a. Document Review: Before commencing work, submit a written statement signed by the Contractor and the Applicator certifying that the Contract Documents, shop drawings and product data have been reviewed with material manufacturers' qualified technical representatives and that they agree the selected materials are proper, compatible with contiguous materials and adequate for the application shown.
- F. Closeout Submittals: Submit for Owner's documentation.
1. Maintenance Data: Maintenance manual, describing the materials, and procedures for cleaning and maintaining each site furnishing. Include manufacturer's data describing the materials and finishes used in the work.

#### **1.4 QUALITY ASSURANCE**

- A. Qualified Installer: The site furnishing work shall be performed by a firm having 5 years experience in the installation of specified materials on comparable projects. The firm shall have been trained by and have the approval of the site furnishing materials manufacturers. The applicator shall provide evidence of successful completion of work of similar scope to that shown and specified for this Project using similar site furnishing systems.
- B. Sole Source Responsibility: Obtain site furnishings from one source of a single manufacturer. Obtain accessory products used in conjunction with site furnishings from the manufacturer or from sources acceptable to the site furnishings manufacturer. The manufacturer shall furnish evidence that the specified materials have been manufactured by the same source and successfully utilized on a yearly basis for a minimum of 5 years on projects of a similar scope to that shown and specified for this Project.
- C. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from authorities.
- D. Pre-Installation Meetings: Prior to the start of the Work, meet at the Project site to review methods and sequence of site furnishings installation, special details and conditions, standard of workmanship, testing and quality control requirements, job organization and other pertinent topics related to the Work.



## **SECTION 12 93 00 SITE FURNISHINGS**

## **DIVISION 12**

### **1.5 DELIVERY STORAGE AND HANDLING**

- A. Storage and Protection: Store site furnishing items and accessories under cover and off the ground. Handle in a manner so as to protect surfaces and to prevent distortion of, and other type of damage to, fabricated pieces.

### **1.6 PROJECT/SITE CONDITIONS**

- A. Weather Conditions: Do not proceed with the Work during inclement weather nor when weather forecasts are unfavorable, unless the Work will proceed in accordance with the manufacturer's requirements and instructions and agreements or restrictions of the Pre-Construction Conference.

## **PART 2 - PRODUCTS**

### **2.1 PRODUCTS**

#### **A. BICYCLE RACKS (BK-01)**

- 1. 1 Loop Wave Style Bike Rack
  - a. Model H-2892BL (U Line)
  - b. 3 Bike Capacity
  - c. Bolt below permeable Paving to concrete putting in grade curb (4) continuous no. 3 bars.

### **2.2 WASTE RECEPTACLES FABRICATION**

#### **A. TRASH RECEPTACLES (TB-01)**

- 1. 50 Gallon River Rock with Domed Top
- 2. Landmark Series (Rubbermaid)
- 3. Graphics: Surface Applied content and style as indicated on Drawings.
  - a. Copy: Trash

#### **B. RECYCLING RECEPTACLES (RY-01)**

- 1. 50 Gallon River Rock with Domed Top
- 2. Landmark Series (Rubbermaid)
- 3. Graphics: Surface Applied content and style as indicated on Drawings.
  - a. Copy: Recycling

### **2.3 SKATE BOARD DETERRENT (SK-01)**

- A. G 135-SS (Skate Stoppers)

### **2.4 BOOK DROP (BD-01)**

- A. S Series SuperMax 70 Versa Outdoor Returns, (Kingsley)

**PART 3 - EXECUTION**

**3.1 GENERAL**

- A. Manufacturer's Instructions: Prepare substrates and install the work of this Section, including components, and accessories in accordance with the manufacturer's instructions, except where more stringent requirements are shown or specified, and where project conditions require extra precautions or provisions to ensure satisfactory performance of the Work.

**3.2 EXAMINATION**

- A. Verification of Conditions: Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

**3.3 PREPARATION**

- A. Substrate Acceptability: Commencement of installation shall constitute acceptance of substrate conditions by the Installer

**3.4 INSTALLATION, GENERAL**

- A. General: Complete field assembly of site furnishings, where required.
- B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed. Install site furnishings level, plumb, true, and securely anchored at locations indicated on Drawings.
- C. Post Setting: Set cast-in support posts in concrete footing with smooth top, shaped to shed water. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at correct angle and are aligned and at correct height and spacing. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.
- D. Posts Set into Voids in Concrete: Form or core-drill holes for installing posts in concrete to depth recommended in writing by manufacturer of site furnishings and 3/4 in. larger than OD of post. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.
- E. Pipe Sleeves: Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.
- F. Trash Receptacles: Trash receptacles shall be erected as indicated on the Drawings, plumb, level, snug, and free from rocking. Make necessary shimming and final

adjustments. Shims shall be stainless steel sized so that they do not protrude beyond the base of the item so as to be visible in completed installation.

- G. Bicycle Rack: Obtain exact dimensions, cut, fit, and drill as necessary for proper assembly and installation of Work and for attaching items of other trades as required. Install bicycle rack level and plumb at the location indicated on the Drawing. Coordinate bicycle rack installation with installation of the surrounding surface at grade beneath the bicycle rack. Protect bicycle rack from paint spatter, splashed concrete, and other construction damage by wrapping and taping in plastic sheeting or heavy kraft paper around the bicycle rack until adjacent work is completed if necessary. Repair damage to the painted finish in a manner consistent with manufacturer's recommendations and with the original bicycle rack paint.

1. Installation Method: As indicated on Drawings

### **3.5 ADJUSTING**

- A. Upon completion of the Work, repair surfaces that have been permanently stained, marred, or otherwise damaged. Replace Work which is damaged or cannot be adequately cleaned as directed.

### **3.6 CLEANING**

- A. Upon completion of the Work, remove unused materials, debris, containers and equipment from the project site. After completing site furnishing installation, inspect components. Remove spots, dirt, and debris. Repair damaged finishes to match original finish or replace component. In addition to the initial cleaning procedure required, and not more than 2 days before occupancy by the Owner, clean the Work.

### **3.7 PROTECTION**

- A. Protect the Work during the construction period so that it will be without indication of use or damage at the time of acceptance.

**END OF SECTION**

**SECTION 22 00 00  
PLUMBING BASIC REQUIREMENTS**

**PART 1 - GENERAL**

**1.1 SECTION INCLUDES**

- A. Work included in 22 00 00, Plumbing Basic Requirements applies to Division 22, Plumbing work to provide materials, labor, tools, permits, incidentals, and other services to provide and make ready for Owner's use of plumbing systems for proposed project.
- B. Contract Documents include, but are not limited to, Specifications including Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Drawings, Addenda, Owner/Architect Agreement, and Owner/Contractor Agreement. Confirm requirements before commencement of work.
- C. Definitions:
  - 1. Provide: To furnish and install, complete and ready for intended use.
  - 2. Furnish: Supply and deliver to project site, ready for unpacking, assembly and installation.
  - 3. Install: Includes unloading, unpacking, assembling, erecting, installation, applying, finishing, protecting, cleaning and similar operations at project site as required to complete items of work furnished.
  - 4. Approved or Approved Equivalent: To possess the same performance qualities and characteristics and fulfill the utilitarian function without any decrease in quality, durability or longevity. For equipment/products defined by the Contractor as "equivalent", substitution requests must be submitted to Engineer for consideration, in accordance with Division 01, General Requirements, and approved by the Engineer prior to submitting bids for substituted items.
  - 5. Authority Having Jurisdiction (AHJ): Indicates reviewing authorities, including local fire marshal, Owner's insurance underwriter, Owner's Authorized Representative, and other reviewing entity whose approval is required to obtain systems acceptance.

**1.2 RELATED SECTIONS**

- A. Contents of Section applies to Division 22, Plumbing Contract Documents.
- B. Related Work:
  - 1. Additional conditions apply to this Division including, but not limited to:
    - a. Specifications including Division 00, Procurement and Contracting Requirements and Division 01, General Requirements.
    - b. Drawings
    - c. Addenda

- d. Owner/Architect Agreement
- e. Owner/Contractor Agreement
- f. Codes, Standards, Public Ordinances and Permits

### **1.3 REFERENCES AND STANDARDS**

- A. References and Standards per Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, individual Division 22, Plumbing Sections and those listed in this Section.
- B. Codes to include latest adopted editions, including current amendments, supplements and local jurisdiction requirements in effect as of the date of the Contract Documents, of/from:
  - 1. State of California:
    - a. CBC - California Building Code
    - b. CEC - California Electrical Code
    - c. CEC T24 - California Energy Code Title 24
    - d. CFC - California Fire Code
    - e. CMC - California Mechanical Code
    - f. CPC - California Plumbing Code
    - g. CSFM - California State Fire Marshal
- C. Reference standards and guidelines include but are not limited to the latest adopted editions from:
  - 1. ABA - Architectural Barriers Act
  - 2. ADA - Americans with Disabilities Act
  - 3. AHRI - Air-Conditioning Heating & Refrigeration Institute
  - 4. ANSI - American National Standards Institute
  - 5. ASCE - American Society of Civil Engineers
  - 6. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers
  - 7. ASHRAE Guideline 0, the Commissioning Process
  - 8. ASME - American Society of Mechanical Engineers

9. ASPE - American Society of Plumbing Engineers
10. ASSE - American Society of Sanitary Engineering
11. ASTM - ASTM International
12. AWWA - American Water Works Association
13. CFR - Code of Federal Regulations
14. CGA - Compressed Gas Association
15. CISPI - Cast Iron Soil Pipe Institute
16. ETL - Electrical Testing Laboratories
17. EPA - Environmental Protection Agency
18. FM - FM Global
19. IAPMO - International Association of Plumbing and Mechanical Officials
20. GAMA - Gas Appliance Manufacturers Association
21. HI - Hydraulic Institute Standards
22. ISO - International Organization for Standardization
23. MSS - Manufacturers Standardization Society
24. NEC - National Electric Code
25. NEMA - National Electrical Manufacturers Association
26. NFGC - National Fuel Gas Code
27. NFPA - National Fire Protection Association
28. NRCA - National Roofing Contractors Association
29. NSF - National Sanitation Foundation
30. OSHA - Occupational Safety and Health Administration
31. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association, Inc.
32. TEMA - Tubular Exchanger Manufacturers Association
33. TIMA - Thermal Insulation Manufacturers Association

34. UL - Underwriters Laboratories Inc.

D. See Division 22, Plumbing individual Sections for additional references.

#### **1.4 SUBMITTALS**

A. See Division 01, General Requirements for Submittal Procedures as well as specific individual Division 22, Plumbing Sections.

B. Provide drawings in format and software release equal to the design documents. Drawings to be the same sheet size and scale as the Contract Documents.

C. In addition:

1. "No Exception Taken" constitutes that review is for general conformance with the design concept expressed in the Contract Documents for the limited purpose of checking for conformance with information given. Any action is subject to the requirements of the Contract Documents. Contractor is responsible for the dimensions and quantity and will confirm and correlate at the job site, fabrication processes and techniques of construction, coordination of the work with that of all other trades, and the satisfactory performance of the work.
2. Provide product submittals and shop drawings in electronic format only. Electronic format must be submitted via zip file via e-mail. For electronic format, provide one file per division containing one bookmarked PDF file with each bookmark corresponding to each Specification Section. Arrange bookmarks in ascending order of Specification Section number. Individual submittals sent piecemeal in a per Specification Section method will be returned without review or comment. All transmissions/submissions to be submitted to Architect. At Contractor's option, two separate submittals may be provided, consisting of underground work and building work. Deviations will be returned without review.
3. Product Data: Provide Manufacturer's descriptive literature for products specified in Division 22, Plumbing Sections.
4. Identify/mark each submittal in detail. Note what differences, if any, exist between the submitted item and the specified item. Failure to identify the differences will be considered cause for disapproval. If differences are not identified and/or not discovered during the submittal review process, Contractor remains responsible for providing equipment and materials that meet the Specifications and Drawings.
  - a. Label submittal to match numbering/references as shown in Contract Documents and schedules. Highlight and label applicable information to individual equipment or cross out/remove extraneous data not applicable to submitted model. Clearly note options and accessories to be provided, including field installed items. Highlight connections by/to other trades.
  - b. Include technical data, installation instructions and dimensioned drawings for products, fixtures, equipment and devices installed, furnished or provided. Reference Division 22, Plumbing Sections for



specific items required in product data submittal outside of these requirements.

- c. Provide pump curves, operation characteristics, capacities, ambient noise criteria, etc. for equipment.
  - d. For vibration isolation of equipment, list make and model selected with operating load and deflection. Indicate frame type where required. Submit manufacturer's product data.
  - e. See Division 22, Plumbing Sections for additional submittal requirements outside of these requirements.
- 5. Maximum of two reviews of complete submittal package. Arrange for additional reviews and/or early review of long-lead items; bear costs of additional reviews at Engineer's hourly rates. Incomplete submittal packages/submittals will be returned to Contractor without review.
  - 6. Structural/Seismic: Provide weights, dimensions, mounting requirements and like information required for mounting, seismic bracing, and support. Indicate manufacturer's installation and support requirements to meet ASCE 7-16 requirements for non-structural components. Provide engineered seismic drawings and equipment seismic certification. Equipment Importance Factor as specified in Division 01 and in Structural documents.
  - 7. Trade Coordination: Include physical characteristics, electrical characteristics, device layout plans, wiring diagrams, and connections as required per Division 22, Plumbing Coordination Documents. For equipment with electrical connections, furnish copy of approved submittal for inclusion in Division 26, Electrical submittals.
  - 8. Make provisions for openings in building for admittance of equipment prior to start of construction or ordering of equipment.
  - 9. Substitutions and Variation from Basis of Design:
    - a. The Basis of Design designated product establishes the qualities and characteristics for the evaluation of any comparable products by other listed acceptable manufacturers if included in this Specification or included in an approved Substitution Request as judged by the Design Professional.
    - b. If substitutions and/or equivalent equipment/products are being proposed, it is the responsibility of parties concerned, involved in, and furnishing the substitute and/or equivalent equipment to verify and compare the characteristics and requirements of that furnished to that specified and/or shown. If greater capacity and/or more materials and/or more labor is required for the rough-in, circuitry or connections than for the item specified and provided for, then provide compensation for additional charges required for the proper rough-in, circuitry and connections for the equipment being furnished. No additional charges

above the Base Bid, including resulting charges for work performed under other Divisions, will be allowed for such revisions. Coordinate with the requirements of "Submittals." For any product marked "or approved equivalent," a substitution request must be submitted to Engineer for approval prior to purchase, delivery or installation.

10. Shop Drawings: Provide coordinated Shop Drawings which include physical characteristics of all systems, equipment and piping layout plans, and control wiring diagrams. Reference individual Division 22, Plumbing Sections for additional requirements for Shop Drawings outside of these requirements.
  - a. Provide Shop Drawings indicating sanitary and storm cleanout locations and type to Architect for approval prior to installation.
  - b. Provide Shop Drawings indicating access panel locations, size and elevation for approval prior to installation.
11. Samples: Provide samples when requested by individual Sections.
12. Resubmission Requirements:
  - a. Make corrections or changes in submittals as required in response to Engineer's comments. Provide a cover letter with resubmittal that includes responses to each of the Engineer's submittal review comments and identifies changes in the resubmittal. Cloud changes in the submittals.
    - 1) Resubmit for review until review indicates "no exception taken" or "make corrections noted."
    - 2) When submitting drawings for Engineer's re-review, clearly indicate changes on drawings and cloud any revisions. Submit a list describing each change.
13. Operation and Maintenance Manuals, Owner's Instructions:
  - a. Submit, at one time, electronic files (PDF format) of manufacturer's operation and maintenance instruction manuals and parts lists for equipment or items requiring servicing. Include valve charts. Submit data when work is substantially complete and in same order format as submittals. Include name and location of source parts and service for each piece of equipment.
    - 1) Include copy of approved submittal data along with submittal review letters received from Engineer. Data to clearly indicate installed equipment model numbers. Delete or cross out data pertaining to other equipment not specific to this project.
    - 2) Include copy of manufacturer's standard Operations and Maintenance for equipment. At front of each tab, provide routine maintenance documentation for scheduled equipment. Include

manufacturer's recommended maintenance schedule and highlight maintenance required to maintain warranty. Furnish list of routine maintenance parts, including part numbers, sizes, quantities, relevant to each piece of equipment: belts, motors, lubricants, and filters.

- 3) Include copy of complete parts list for equipment. Include available exploded views of assemblies and sub assemblies.
  - 4) Include copy of startup and test reports specific to each piece of equipment.
  - 5) Include copy of final water systems balancing log along with pump operating data.
  - 6) Include commissioning reports.
  - 7) Include copy of pressure, flow, leakage and purity test data and air and water systems test data, as applicable. Include copy of third-party and state and local jurisdiction inspection reports.
  - 8) Include copy of valve charts/schedules.
  - 9) Include Warranty per Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 22 00 00, Plumbing Basic Requirements and individual Division 22, Plumbing Sections.
  - 10) Include product certificates of warranties and guarantees.
  - 11) Engineer will return incomplete documentation without review. Engineer will provide one set of review comments in Submittal Review format. Contractor must arrange for additional reviews; Contractor to bear costs for additional reviews at Engineer's hourly rates.
- b. Thoroughly instruct Owner in proper operation of equipment and systems. Where noted in individual Sections, training will include classroom instruction with applicable training aids and systems demonstrations. Field instruction per Section 22 00 00, Plumbing Basic Requirements article titled "Demonstration."
- c. Copies of certificates of code authority inspections, acceptance, code required acceptance tests, letter of conformance and other special guarantees, certificates of warranties, specified elsewhere or indicated on Drawings.
14. Record Drawings:
- a. Maintain at site at least one set of drawings for recording "As-constructed" conditions. Indicate on Drawings changes to original

documents by referencing revision document, and include buried elements, location of cleanouts, and location of concealed mechanical items. Include items changed by field orders, supplemental instructions, and constructed conditions.

- b. Record Drawings are to include equipment and fixture/connection schedules that accurately reflect "as constructed or installed" for Project.
- c. At completion of project, input changes to original project on CAD Drawings and make one set of black-line drawings created from CAD Files in version/release equal to contract drawings. Submit CAD Files and drawings upon substantial completion.
- d. Provide Invert elevations and dimensioned locations for water services, building waste, and storm drainage piping below grade extending to 5-feet outside building line.
- e. See Division 22, Plumbing individual Sections for additional items to include in record drawings.

## 1.5 QUALITY ASSURANCE

- A. Regulatory Requirements: Work and materials installed to conform with all local, State and Federal codes, and other applicable laws and regulations. Where code requirements are at variance with Contract Documents, meet code requirements as a minimum requirement and include costs necessary to meet these in Contract. Machinery and equipment are to comply with OSHA requirements, as currently revised and interpreted for equipment manufacturer requirements. Install equipment provided per manufacturer recommendations.
- B. Whenever this Specification calls for material, workmanship, arrangement or construction of higher quality and/or capacity than that required by governing codes, higher quality and/or capacity take precedence.
- C. Drawings are intended to be diagrammatic and reflect the Basis of Design manufacturers equipment. They are not intended to show every item in its exact dimensions, or details of equipment or proposed systems layout. Verify actual dimensions of systems (i.e., piping) and equipment proposed to assure that systems and equipment will fit in available space. Contractor is responsible for design and construction costs incurred for equipment other than Basis of Design, including, but not limited to, architectural, structural, electrical, HVAC, fire sprinkler, and plumbing systems.
- D. Manufacturer's Instructions: Follow manufacturer's written instructions. If in conflict with Contract Documents, obtain clarification. Notify Engineer/Architect, in writing, before starting work.
- E. Items shown on Drawings are not necessarily included in Specifications or vice versa. Confirm requirements in all Contract Documents.
- F. Provide products that are UL listed.

- G. Piping Insulation products to contain less than 0.1 percent by weight PBDE in all insulating materials.
- H. All potable water system components, devices, material, or equipment containing a weighted average of greater than 0.25 percent lead are prohibited, and shall be certified in accordance with current editions of the Safe Drinking Water Act (SDWA), NSF 61 & NSF 372. Endpoint devices used to dispense water for drinking shall meet the requirements of NSF 61.
- I. ASME Compliance: ASME listed water heaters and boilers with an input of 200,000 BTUH and higher, hot water storage tanks which exceed 120 gallons, and hot water expansion tanks which are connected to ASME rated equipment or required by code or local jurisdiction.
- J. Provide safety controls required by National Boiler Code (ASME CSD 1) for boilers and water heaters with an input of 400,000 BTUH and higher.

#### **1.6 WARRANTY**

- A. Provide written warranty covering the work for a period of one year from date of Substantial Completion in accordance with Division 00, Contracting and Procurement Requirements, Division 01, General Requirements, Section 22 00 00, Plumbing Basic Requirements and individual Division 22, Plumbing Sections.
- B. Sections under this Division can require additional and/or extended warranties that apply beyond basic warranty in Division 01, General Requirements and the General Conditions. Confirm requirements in all Contract Documents.

#### **1.7 COORDINATION DOCUMENTS**

- A. Prior to construction, prepare and submit coordinated layout drawings (composite drawings) to coordinate installation and location of ductwork, grilles, diffusers, piping, fire sprinklers, plumbing, lights, and electrical services. Composite Drawings show services on single sheet. Key Drawings to structural column identification system. Prior to completion of Drawings, coordinate proposed installation with architectural and structural requirements, and other trades (including plumbing, HVAC, fire protection, electrical, ceiling suspension, and ceiling tile systems, etc.), and provide maintenance access requirements. Coordinate with submitted architectural systems (i.e. roofing, ceiling, finishes) and structural systems as submitted, including footings and foundation. Identify zone of influence from footings and ensure systems are not routed within the zone of influence.
- B. Prepare Drawings as follows:
  - 1. Drawings in Revit Model. CAD format or Revit Model release equal to design documents. Drawings to be same sheet size and scale as Contract Drawings and indicate location, size and elevation above finished floor of equipment and distribution systems.
  - 2. Review and revise, as necessary, section cuts in Contract Drawings after verification of field conditions.

3. Indicate plumbing system piping including fittings, hangers, access panels, valves, and bottom of pipe elevations above finished floor.
  4. Indicate inverts and provision for piping that must be graded to have right-of-way over more flexible items. Drawings also to indicate proposed ceiling grid and lighting layout as shown on electrical drawings and architectural reflected ceiling drawings and HVAC equipment, ductwork and piping.
  5. Incorporate Addenda items and change orders.
  6. Distribute drawings to trades and provide additional coordination as requested by other trades.
- C. Advise Architect in the event a conflict occurs in location or connection of equipment. Bear costs resulting from failure to properly coordinate installation or failure to advise Architect of conflict.
- D. Submit final Coordination Drawings with changes as Record Drawings at completion of project.

## **1.8 WORK INCLUDED**

- A. Furnish and install sleeves, inserts and anchorage required for the installation, which are embedded in work of other trades. Sleeve, wrap and seal piping in concrete.
- B. Electrical: For plumbing trim/devices/equipment, provide, from the line voltage connection by Division 26, the low voltage electrical connections and wiring as required for complete and operable system. Includes, but is not limited to: Low voltage electrical raceway, wiring and accessories, such as step-down transformers as necessary for function of sensors and automatic valve and faucet controls. Supply step-down transformers and size wiring as recommended by manufacturer of plumbing trim/faucets requiring electrical low voltage connection.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Articles, fixtures, and equipment of a kind to be standard product of one manufacturer, including but not limited to fixtures, pumps, drains and equipment.

### **2.2 STANDARDS OF MATERIALS AND WORKMANSHIP**

- A. Base contract upon furnishing materials as specified. Materials, equipment, and fixtures used for construction are to be new, latest products as listed in manufacturer's printed catalog data and are to be UL or ETL listed and labeled or be approved by State, County, and City authorities prior to procurement and installation.
- B. Names and manufacturer's names denote character and quality of equipment desired and are not to be construed as limiting competition.
- C. Hazardous Materials:

1. Comply with local, State of California, and Federal regulations relating to hazardous materials.
2. Comply with Division 00, Procurement and Contracting Requirements and Division 01, General Requirements for this project relating to hazardous materials.
3. Do not use any materials containing a hazardous substance. If hazardous materials are encountered, do not disturb; immediately notify Owner and Architect. Hazardous materials will be removed by Owner under separate contract.

### **PART 3 - EXECUTION**

#### **3.1 ACCESSIBILITY AND INSTALLATION**

- A. Confirm Accessibility and Installation requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 22 00 00, Plumbing Basic Requirements and individual Division 22, Plumbing Sections.
- B. Install equipment requiring access (i.e., drain pans, drains, control operators, valves, motors, cleanouts and water heaters) so that they may be serviced, reset, replaced or recalibrated by service people with normal service tools and equipment. Do not install equipment in obvious passageways, doorways, scuttles or crawlspaces which would impede or block intended usage.
- C. Install equipment and products complete as directed by manufacturer's installation instructions. Obtain installation instructions from manufacturer prior to rough-in of equipment and examine instructions thoroughly. When requirements of installation instructions conflict with Contract Documents, request clarification from Architect prior to proceeding with installation. This includes proper installation methods, sequencing, and coordination with other trades and disciplines.
- D. Earthwork:
  1. Confirm Earthwork requirements in Contract Documents. In absence of specific requirements, comply with individual Division 22, Plumbing Sections and the following:
    - a. Perform excavation, dewatering, shoring, bedding, and backfill required for installation of work in this Division in accordance with the provisions of related earthwork Sections/divisions. Contact utilities and locate existing utilities prior to excavation. Repair any work damaged during excavation or backfilling.
    - b. Excavation: Do not excavate under footings, foundation bases, or retaining walls.
    - c. Provide protection of underground systems. Review the project Geotechnical Report for references to corrosive or deleterious soils

which will reduce the performance or service life of underground systems materials.

**E. Firestopping:**

1. Confirm Firestopping requirements in Division 07, Thermal and Moisture Protection. In absence of specific requirements, comply with individual Division 22, Plumbing Sections and the following:
  - a. Coordinate location and protection level of fire and/or smoke rated walls, ceilings, and floors. When these assemblies are penetrated, seal around piping, ductwork and equipment with approved firestopping material. Install firestopping material complete as directed by manufacturer's installation instructions. Meet requirements of ASTM E814, Standard Test Method for Fire Tests of Through-Penetration Fire Stops.

**F. Pipe Installation:**

1. Provide installation of piping systems coordinated to account for expansion and contraction of piping materials and building as well as anticipated settlement or shrinkage of building. Install work to prevent damage to piping, equipment, and building and its contents. Provide piping offsets, loops, expansion joints, sleeves, anchors or other means to control pipe movement and minimize forces on piping. Verify anticipated settlement and/or shrinkage of building with Project Structural Engineer. Verify construction phasing, type of building construction products and rating for coordinating installation of piping systems.
2. Include provisions for servicing and removal of equipment without dismantling piping.

**G. Plenums:**

1. Provide plenum rated materials that meet the requirements to be installed in plenums. Immediately notify Architect/Engineer of discrepancy.

**3.2 SEISMIC CONTROL**

- A.** Confirm Seismic Control requirements in Division 01, General Requirements, Structural documents, and individual Division 22 Plumbing Sections.

**B. General:**

1. Earthquake resistant designs for Plumbing (Division 22) equipment and distribution, i.e. motors, plumbing systems, piping, equipment, water heaters, boilers, etc. to conform to regulations of jurisdiction having authority.
2. Restraints which are used to prevent disruption of function of piece of equipment because of application of horizontal force to be such that forces are carried to frame of structure in such a way that frame will not be deflected when apparatus is attached to a mounting base and equipment pad, or to structure in normal way, utilizing attachments provided. Secure equipment and distribution systems to



withstand a force in direction equal to value defined by jurisdiction having authority.

3. Provide stamped Shop Drawings from licensed Structural Engineer of seismic bracing and seismic movement assemblies for piping equipment and water heaters. Submit Shop Drawings along with equipment submittals.
4. Provide stamped Shop Drawings from licensed Structural Engineer of seismic flexible joints for piping and crossing building expansion or seismic joints. Submit Shop Drawings along with seismic bracing details.

C. Piping:

1. Per "Seismic Restraints Manual Guidelines for Mechanical Systems" latest edition published by SMACNA or local requirements.

D. Provide means to prohibit excessive motion of plumbing equipment during earthquake.

**3.3 REVIEW AND OBSERVATION**

- A. Confirm Review and Observation requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 22 00 00, Plumbing Basic Requirements and individual Division 22, Plumbing Sections.
- B. Notify Architect, in writing, at following stages of construction so that they may, at their option, visit site for review and construction observation:
  1. Underground piping installation prior to backfilling.
  2. Prior to covering walls.
  3. Prior to ceiling cover/installation.
  4. When main systems, or portions of, are being tested and ready for inspection by AHJ.
- C. Bear responsibility and cost to make piping accessible, to expose concealed lines, or to demonstrate acceptability of the system. If Contractor fails to notify Architect at times prescribed above, costs incurred by removal of such work are the responsibility of the Contractor.
- D. Final Punch:
  1. Prior to requesting a final punch visit from the Engineer, request from Engineer the Plumbing Precloseout Checklist, complete the checklist confirming completion of systems' installation, and return to Engineer. Request a final punch visit from the Engineer, upon Engineer's acceptance that the plumbing systems are ready for final punch.
  2. Costs incurred by additional trips required due to incomplete systems will be the responsibility of the Contractor.

### **3.4 CUTTING AND PATCHING**

- A. Confirm Cutting and Patching requirements in Division 01, General Requirements. In absence of specific requirements, comply with individual Division 22, Plumbing Sections and the following:
1. Proposed floor cutting/core drilling/sleeve locations to be approved by Project Structural Engineer. Submit proposed locations to Architect/Project Structural Engineer. Where slabs are of post tension construction, perform x-ray scan of proposed penetration locations and submit scan results including proposed penetration locations to Project Structural Engineer/Architect for approval. Where slabs are of waffle type construction, show column cap extent and cell locations relative to proposed penetration(s).
  2. Cutting, patching and repairing for work specified in this Division including plastering, masonry work, concrete work, carpentry work, and painting included under this Section will be performed by skilled craftspeople of each respective trade in conformance with appropriate Division of Work.
  3. Additional openings required in building construction to be made by drilling or cutting. Use of jack hammer is specifically prohibited. Patch openings in and through concrete and masonry with grout.
  4. Restore new or existing work that is cut and/or damaged to original condition. Patch and repair specifically where existing items have been removed. This includes repairing and painting walls, ceilings, etc. where existing piping and devices are removed as part of this project. Where alterations disturb lawns, paving, and walks, surfaces to be repaired, refinished and left in condition matching existing prior to commencement of work.
  5. Additional work required by lack of proper coordination will be provided at no additional cost to the Owner.

### **3.5 EQUIPMENT SELECTION AND SERVICEABILITY**

- A. Replace or reposition equipment which is too large or located incorrectly to permit servicing, at no additional cost to Owner.

### **3.6 DELIVERY, STORAGE AND HANDLING**

- A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with individual Division 22, Plumbing Sections and the following:
1. Handle materials delivered to project site with care to avoid damage. Store materials on site inside building or protected from weather, dirt and construction dust. Insulation and lining that becomes wet from improper storage and handling to be replaced before installation. Products and/or materials that become damaged due to water, dirt and/or dust as a result of improper storage to be replaced before installation.

2. Protect equipment and pipe to avoid damage. Close pipe openings with caps or plugs. Keep motors and bearings in watertight and dustproof covers during entire course of installation.
3. Protect bright finished shafts, bearing housings and similar items until in service.

### **3.7 DEMONSTRATION**

- A. Confirm Demonstration requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 22 00 00, Plumbing Basic Requirements and individual Division 22, Plumbing Sections.
- B. Upon completion of work and adjustment of equipment and test systems, demonstrate to Owner's Authorized Representative, Architect and Engineer that equipment furnished and installed or connected under provisions of these Specifications functions in manner required. Provide field instruction to Owner's Maintenance Staff as specified in Division 01, General Requirements, Section 22 00 00, Plumbing Basic Requirements and individual Division 22, Plumbing Sections.
- C. Manufacturer's Field Services: Furnish services of a qualified person at time approved by Owner, to instruct maintenance personnel, correct defects or deficiencies, and demonstrate to satisfaction of Owner that entire system is operating in satisfactory manner and complies with requirements of other trades that may be required to complete work. Complete instruction and demonstration prior to final job site observations.

### **3.8 CLEANING**

- A. Confirm cleaning requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 22 00 00, Plumbing Basic Requirements and individual Division 22, Plumbing Sections.
- B. Upon completion of installation, thoroughly clean exposed portions of equipment, removing temporary labels and traces of foreign substances. Throughout work, remove construction debris and surplus materials accumulated during work.

### **3.9 INSTALLATION**

- A. Confirm installation requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 22 00 00, Plumbing Basic Requirements and individual Division 22, Plumbing Sections.
- B. Install equipment and fixtures in accordance with manufacturer's installation instructions, plumb and level and firmly anchored to vibration isolators. Maintain manufacturer's recommended clearances.
- C. Start up equipment, in accordance with manufacturer's start-up instructions, and in presence of manufacturer's representative. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.
  1. Do not place equipment in sustained operation prior to initial balancing of plumbing systems.

2. Provide pump impellers to obtain Basis of Design design capacities.
- D. Provide miscellaneous supports/metals required for installation of equipment and piping.

### **3.10 PAINTING**

- A. Confirm requirements in Division 01, General Requirements and Division 09, Finishes. In absence of specific requirements, comply with individual Division 22, Plumbing Sections and the following:
  1. Ferrous Metal: After completion of plumbing work, thoroughly clean and paint exposed supports constructed of ferrous metal surfaces, i.e., hangers, hanger rods, equipment stands, with one coat of black asphalt for exterior or black enamel for interior, suitable for hot surfaces.
  2. In a mechanical room, on roof or other exposed areas, machinery and equipment not painted with enamel to receive two coats of primer and one coat of rustproof enamel, colors as selected by Architect.
  3. See individual equipment Specifications for other painting.
  4. Structural Steel: Repair damage to structural steel finishes or finishes of other materials damaged by cutting, welding or patching to match original.
  5. Piping: Clean, primer coat and paint exposed piping on roof or at other exterior locations with two coats paint suitable for metallic surfaces and exterior exposures. Color selected by Architect.
  6. Covers: Covers such as manholes, cleanouts and the like will be furnished with finishes which resist corrosion and rust.

### **3.11 ACCEPTANCE**

- A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with individual Sections in Division 22, Plumbing and the following:
  1. System cannot be considered for acceptance until work is completed and demonstrated to Architect that installation is in strict compliance with Specifications, Drawings and manufacturer's installation instructions, particularly in reference to following:
    - a. Testing and Balancing Reports
    - b. Cleaning
    - c. Operation and Maintenance Manuals
    - d. Training of Operating Personnel
    - e. Record Drawings

- f. Warranty and Guaranty Certificates
- g. Start-up/Test Document and Commissioning Reports

### **3.12 FIELD QUALITY CONTROL**

- A. Confirm Field Quality Control requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 22 00 00, Plumbing Basic Requirements and individual Division 22, Plumbing Sections.
- B. Tests:
  - 1. Conduct tests of equipment and systems to demonstrate compliance with requirements specified. Reference individual Specification Sections for required tests. Document tests and include in operation and maintenance manuals.
  - 2. During site evaluations by Architect or Engineer, provide appropriate personnel with tools to remove and replace trims, covers, and devices so that proper evaluation of installation can be performed.

### **3.13 LETTER OF CONFORMANCE**

- A. Provide Letter of Conformance, copies of manufacturers' warranties and extended warranties with a statement that plumbing items were installed in accordance with manufacturer's recommendations, UL listings and FM Global approvals. Include Letter of Conformance, copies of manufacturers' warranties and extended warranties in Operation and Maintenance Manuals.

### **3.14 ELECTRICAL INTERLOCKS**

- A. Where equipment motors are to be electrically interlocked with other equipment for simultaneous operation, utilize plumbing equipment wiring diagrams to coordinate with electrical systems so that proper wiring of equipment involved is affected.

**END OF SECTION**

**SECTION 22 00 05  
PLUMBING PRE-CLOSEOUT CHECKLIST**

**PART 1 - GENERAL**

**1.1 WORK INCLUDED**

- A. Circulation Pumps
- B. Electrical Water Heater
- C. Plumbing Fixtures
- D. Plumbing Piping
- E. Plumbing System Controls

**1.2 PRE-CLOSEOUT CHECKLIST SUBMITTAL**

- A. Two weeks prior to the Engineer's Punch-Walk request, complete and submit Pre-Closeout Checklist to document compliance with the Contract Documents and that systems are functionally operational and ready for Closeout Inspection.
- B. A Closeout/Punch-Walk inspection will only be scheduled after completion of Pre-Closeout Checklist and Engineer's acceptance of its completeness.
- C. The Pre-Closeout Checklist is a general guide to document compliance with the Contract Documents and is not an all-inclusive list of Contract requirements, and it is the responsibility of the Contractor to ensure the installation is complete and in full conformance with the Contract Documents.
- D. Complete and submit Pre-Closeout Checklist, as indicated in Part 3.
- E. Unless all similar equipment have exactly the same level of completeness, reproduce the Checklist as needed and submit one checklist for each equipment.

**PART 2 - EQUIPMENT - NOT USED**

**PART 3 - INSTALLATION**

**3.1 PRE-CLOSEOUT CHECKLIST**

- A. Circulation Pumps:
  - 1. General:

Yes	No	Task	Comment
		Piping system installed.	
		Piping system pressure tested.	
		Pump not leaking.	



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Yes	No	Task	Comment
		Field-assembled couplings aligned to meet manufacturer's prescribed tolerances.	
		Pressure and temperature gauges properly installed.	

2. Electrical:

Yes	No	Task	Comment
		Power available to pump disconnect.	
		Pump rotation verified.	
		Control system interlocks functional.	
		Power disconnect is located within sight of the unit it controls.	
		VFD is installed and connected.	

3. Testing, Adjusting, and Balancing:

Yes	No	Task	Comment
		Water balance complete.	
		Water balance with design maximum flow.	
		TAB report submitted.	
		TAB closeout items resolved.	

B. Electrical Water Heater:

1. Electrical:

Yes	No	Task	Comment
		Power connected.	

2. Piping:

Yes	No	Task	Comment
		Piping connection provided with union or flexible connector.	
		Valves and fittings installed per piping diagram (or boiler MPR recommendation).	
		Temperature gauges provided.	
		Relief valve set at relief/release pressure.	
		Relief valve piped to floor sink/drain.	



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Yes	No	Task	Comment
		Integral boiler circulator accessible (if provided).	
		Piping pressure tested.	
		Piping inlet-outlet connection matched with supply-return flow.	

3. Expansion Tank:

Yes	No	Task	Comment
		Expansion tank has adequate mounting support.	
		Piping connection union provided.	
		Isolation valve provided.	
		Tank pressure set at desired pressure.	
		No isolation valve installed.	

4. Master Mixing Valve:

Yes	No	Task	Comment
		Piped per manufacturer's piping diagram.	
		Set temperature is being provided.	

5. Drain Pan:

Yes	No	Task	Comment
		Verify if drain pan is installed per detail.	
		Verify if drain pan drain is routed indirect to indirect waste receiver.	

6. Seismic Bracing:

Yes	No	Task	Comment
		Seismic bracing is installed.	

7. Unit:

Yes	No	Task	Comment
		Equipment identification plate intact.	
		Equipment tag provided.	





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**C. Plumbing Fixtures:**

**1. General:**

Yes	No	Task	Comment
		Installed at all locations on Drawings.	
		Installed plumbing and edge at wall caulked.	
		Test with no leaks.	
		Insulation installed on ADA fixtures, p-trap, and hot water supply/stop.	

**D. Plumbing Piping:**

**1. Installation:**

Yes	No	Task	Comment
		Piping complete.	
		As-built shop drawings submitted to Interface Engineering.	
		Piping flushed and cleaned (Interface has received report from contractor).	
		Strainers cleaned.	
		Valves installed as required.*	
		Piping insulated as required.	
		Thermometers and gauges installed as required.*	
		Air vents installed as specified.*	
		Flexible connectors installed as specified.*	
		Verify that piping has been labeled and valves are identified as specified.**	
		Piping properly supported.**	

a. \*Checklist completed using sampling: 10-percent were reviewed for each system (terminal units, fan coils, heat pumps, and the like). Sampling was not used for pumps, chillers, boilers, central heat pumps, storage tanks, heat exchangers, and central system air handlers.

b. \*\*Spot-checking was completed during pre-closeout review.



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2. Miscellaneous:

Yes	No	Task	Comment
		Seismic bracing expansion/contraction compensators installed.	
		Piping systems identification completed per specification requirements.	
		Valves identified per specifications.	
		Valves (type) per specifications.	

E. Plumbing System Controls:

1. Installation:

Yes	No	Task	Comment
		As-built shop drawings submitted.	
		Framed instructions mounted in or near control panel.	
		Components properly labeled (on inside and outside of panel).	
		Control components piped and/or wired to each labeled terminal strip.	
		EMCS connection made to each labeled terminal strip as shown.	
		Control wiring and tubing labeled at all terminations, splices, and junctions.	
		Shielded wiring used on electric sensors.	
		Air dryer installed as specified (pneumatic).	
		Water drain installed as specified (pneumatic).	
		Temperature sensors installed in each room specified.	
		Carbon dioxide sensors installed in each room specified.	

**END OF SECTION**

**SECTION 22 05 13  
COMMON MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Work Included:
  - 1. General Motor Construction and Requirements
  - 2. Starters
  - 3. Variable Frequency Drives
  - 4. Disconnects

**1.2 RELATED SECTIONS**

- A. Contents of Division 22, Plumbing, and Division 01, General Requirements, apply to this Section.

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.
- B. In addition, meet the following:
  - 1. NEMA Premium Efficiency.
  - 2. Energy Policy Act (EPACT), latest applicable version(s) for minimum motor efficiencies.

**1.4 SUBMITTALS**

- A. Submittals as required by Section 22 00 00, Plumbing Basic Requirements, and Division 01, General Requirements.

**1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements apply to this Section.
- B. In addition, meet the following:
  - 1. Field Installed Motors: Installed motors to be of single type, from one source and from a single manufacturer.
  - 2. Electrical components and materials to be UL and ETL listed/labeled as suitable for location and use.



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3. Variable Frequency Drives: Materials and installation for a complete adjustable frequency motor drive consisting of a pulse width modulated (PWM) inverter for use on a standard NEMA Design B induction motor. Design drive specifically for variable torque applications. Variable Frequency Drive (VFD) provided by Controls Section or equipment manufacturer.
  - a. A firm engaged in the production of this type of equipment for a minimum of 10 years.
  - b. Testing: Test printed circuit boards and burned in before being assembled into the completed VFD. Subject VFD to a preliminary functional test, minimum 8-hour burn-in, and computerized final test at 104 degrees F at full rated load.
  - c. Qualifications:
    - 1) UL Listed.
    - 2) C-UL listed or CSA approved.
    - 3) Warranty: 12 months from the date of certified start-up. Include parts, labor, travel time, and expenses.

**1.6 WARRANTY**

- A. Warranty of materials and workmanship as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.
- B. In addition, provide:
  1. For motors 50 HP and Larger: Provide five year manufacturer's limited warranty from date of substantial completion.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Motors (General):
  1. Lincoln Motors
  2. Century Electric Motors (formerly A.O. Smith Electrical Products)
  3. Baldor Electric (Reliance Electric)
  4. General Electric
  5. Toshiba
  6. Or approved equivalent.



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7. Exceptions: Motors integral to equipment efficiency listing (EER, COP, etc.) per listing agency.

**B. Starters:**

1. Cerus
2. Eaton Electrical
3. General Electric
4. Siemens
5. Schneider Electric/Square D
6. Or approved equivalent.

**C. Variable Frequency Drives:**

1. ABB
2. Allen Bradley
3. Cerus
4. Danfoss
5. Emerson
6. General Electric
7. Siemens
8. Schneider Electric/Square D
9. Toshiba
10. Trane
11. Yaskawa
12. Or approved equivalent.

**D. Disconnects:**

1. Provided and installed by Division 26, Section 26 28 16, Enclosed Switches and Circuit Breakers. See this section for manufacturer information.



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**2.2 GENERAL MOTOR CONSTRUCTION AND REQUIREMENTS**

- A. Electrical components and materials to be UL to ETL listed/labeled as suitable for location and use.
- B. Wiring installed in conduit.
- C. Electrical Service: Power wiring from source to motor termination under Division 26, Electrical. Coordinate location of disconnect and starter or motor controller. Combination starter/disconnects may be used in lieu of separate items.
- D. Electrical Service - Unless otherwise noted in the Contract Documents, the following voltage and phase characteristics apply to motors:
  - 1. Motors 1/2 HP and Under: 120 volt, 1 phase.
  - 2. Motors 3/4 HP and Over: 208 volt, 3 phase.
  - 3. Motors 3/4 HP and Over: 480 volt, 3 phase
- E. Construction:
  - 1. Open drip-proof type except where specifically noted otherwise.
  - 2. Design for continuous operation in 104 degrees F environment.
  - 3. Design for temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.
  - 4. Built-in thermal overload protection or externally protected with separate overload with low-voltage release or lock-out. Quick trip device on hermetically sealed motors.
  - 5. Service Factor: 1.15 for poly-phase motors. 1.25 for motors associated with shaft pressurization system fans. 1.35 for single phase motors.
  - 6. Noise Rating: Quiet.
  - 7. Efficiency: Provide premium efficiency motors.
  - 8. Motors used in Conjunction with Variable Speed Drives: Variable torque type matched for the full operating range of the variable frequency drive. As a minimum, motors to have Class F insulation, winding insulation rated for 1000 volts and insulated bearings to prevent high frequency ground path. Loads not-to-exceed 80 percent of nameplate rating.
- F. Explosion-Proof Motors: UL approved and labelled for hazard classification with over temperature protection.



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- G. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.
- H. Wiring Terminations:
  - 1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Coordinate conductor sizes with Division 26, Electrical. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
  - 2. For fractional horsepower motors where connection is made directly, provide conduit connection in end frame.
- I. Provide inverter ready motors per NEMA MG1-30 for variable speed drive or soft-start starter use. Provide shaft grounding for motors over 2 HP serving variable speed drives. Provide shaft grounding and insulated bearings on motors 25 HP and larger serving variable speed drives. Shielded cable required for power wiring from variable speed drive to motor connection.
- J. Unless otherwise indicated, motors 1-HP and larger to meet/exceed NEMA Premium Efficiency and latest EPACT.
- K. Vertical in-line pump motors per NEMA MG1, Motors and Generators.

**2.3 STARTERS**

- A. Single-Phase Motors:
  - 1. Manual across-the-line starting switch having toggle-operated switch pilot running light and built-in thermal overload device with heating element rated not more than 115 percent motor full load current indicated on name plate of motor to be protected. Surface mount starters. Provide NEMA-1 enclosure.
  - 2. Overload relays to be melting alloy type with a replaceable control circuit module. Thermal units to be interchangeable. Starter to be nonoperative if thermal unit is removed.
  - 3. Single-phase motors with automatic controls. Provide motor-rated relay with coils rated for control voltage.
- B. Starters up to Size 8 to be suitable for the addition of a minimum of three external auxiliary contacts (normally open or normally closed). Contactor, coils and relays to perform the control functions of the associated equipment and control sequence.
- C. 3-Phase Motors up to and Including 15 HP:
  - 1. Provide enclosed type magnetic across-the-line starter with thermal overload and undervoltage protection.
  - 2. Operator: "Start-Stop" pushbutton, except where automatic control is indicated on Drawings or specified. Then provide "Hand-Off-Auto" selector switch.



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3. Starters for 3-phase motors to have overload protection in each of the three legs, with external manual reset.

**2.4 VARIABLE FREQUENCY DRIVES**

- A. Design: Solid state, with a Pulse Width Modulated (PWM) output waveform enclosed in a NEMA 1 enclosure, completely assembled and tested by manufacturer. Employ a full wave rectifier (to prevent input line notching), DC Line Reactor, capacitors, and Insulated Gate Bipolar Transistors (IGBTs) as the output switching device drive efficiency: 97 percent or better at full speed and full load. Fundamental Power Factor: 0.98 at all speeds and loads. Unit designed to feed two motors simultaneously.
- B. Specifications:
  1. Input 440/450/480/500VAC plus or minus 10 percent (capable of operation to 550VAC), 3-phase, 48 to 63Hz or Input 208/220/230/240VAC plus or minus 10 percent, 3-phase, 48 to 63Hz.
  2. Output 0 - Input Voltage, 3-phase, 0 to 500Hz for drives up to 75 HP; 0 to 120Hz for drives over 75 HP.
  3. Environmental Operating Conditions: 0 to 40C at 3kHz switching frequency, 0 to 3300-feet above sea level, less than 95 percent humidity, noncondensing.
  4. Enclosure rated Type 1.
- C. Standard Features:
  1. Provide VFDs with the same customer interface, including digital display, keypad and customer connections; regardless of horsepower rating. The keypad is to be used for local control (start/stop, forward/reverse, and speed adjust), for setting parameters, and for stepping through the displays and menus.
  2. Fault Mode on Loss of Input:
    - a. Displaying a fault.
    - b. Running at a programmable preset speed as selected by user.
  3. Utilize English digital display (code numbers are not acceptable). Digital Display: A 40 character (2 line by 20 characters/line) LCD display, backlit to provide easy viewing in light condition, adjustable contrast to optimize viewing at angles display. Set-up parameters, indications, faults, warnings and other information in words to allow the user to understand what is being displayed without the use of a manual or cross reference table.
  4. Utilize preprogrammed application macro's specifically designed to facilitate start-up. Provide one command to reprogram parameters and customer interfaces for a particular application to reduce programming time.





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5. Automatic restart after an overcurrent, overvoltage, undervoltage, or loss of input signal protective trip. The number of restart attempts, trial time, and time between reset attempts to be programmable. If the time between reset attempts is greater than zero, the time remaining until reset occurs to count down on the display to warn an operator that a restart will occur.
  6. Capable of starting into a rotating load (forward or reverse) and accelerate or decelerate to setpoint without safety tripping or component damage (flying start).
  7. Automatic extended power loss ride-through circuit.
  8. Customer terminal strip isolated from the line and ground.
    - a. Prewired three-position Hand-Off-Auto switch and speed potentiometer. When in "Off" the VFD will be stopped. When in "Auto" the VFD will start via an external contact closure, and its speed will be controlled via an external speed reference.
  9. Current Limit Circuits to Provide Trip Free Operation:
    - a. Slow current regulation limit circuit adjustable to 125 percent (minimum) of the VFDs variable torque current rating. Adjustment made via the keypad, and displayed in amps.
    - b. Rapid current regulation limit adjustable to 170 percent (minimum) of the VFDs variable torque current rating.
    - c. Current switch off limit fixed at 255 percent (minimum, instantaneous) of the VFDs variable torque current rating.
  10. Overload Rating: 110 percent of its variable torque current rating for 1 minute every 10 minutes, and 140 percent of its H torque current rating for 2 seconds every 15 seconds.
  11. DC Line Reactor to reduce the harmonics to the power line.
  12. Optimized for a 3 kHz carrier frequency to reduce motor noise.
  13. Manual speed potentiometer or keypad as a means of controlling speed manually.
- D. Adjustments:
1. Five programmable critical frequency lockout ranges.
  2. PI setpoint controller.
  3. Two programmable analog inputs for reference for PI controller. Analog Inputs: Include filters; programmable from 0.01 to 10 seconds to remove oscillation in the input signal.



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4. Six programmable digital inputs for maximum flexibility in interfacing with external devices.
  5. Two programmable analog outputs proportional to frequency, motor speed, output voltage, output current.
  6. Two independently adjustable accel and decel ramps. Ramp times adjustable from 1 to 1800 seconds.
  7. The VFD to ramp or coast to a stop, as selected by user.
- E. Display: The following operating information displays to be standard on the VFD digital display.
1. Output Frequency
  2. Motor Speed (RPM, percent or engineering units)
  3. Motor Current
  4. Calculated Motor Torque
  5. Calculated Motor Power
  6. Output Voltage
  7. Analog Input Values
  8. Keypad Reference Values
  9. Elapsed Time Meter
  10. kWh Meter
- F. Protection Circuits: In the case of a protective trip, stop the drive and announce the fault condition.
1. Overcurrent trip 315 percent instantaneous (225 percent RMS) of the VFDs variable torque current rating.
  2. Overvoltage trip 130 percent of the VFD's rated voltage.
  3. Undervoltage trip 65 percent of the VFD's rated voltage.
  4. Overtemperature plus 70C (ACH 501); plus 85C (ACH 502).
  5. Ground Fault either running or at start.
  6. Adaptable Electronic Motor Overload (I2t).
- G. Speed Command Input Via:



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1. Keypad.
2. Two analog inputs, each capable of accepting a 0 to 20mA, 4 to 20mA, 0 to 10V, 2 to 10V signal. Analog inputs programmable filter to remove an oscillation of the reference signal. Minimum and maximum values (gain and offset) adjustable within the range of 0 to 20mA and 0 to 10V.

**H. Accessories:**

1. Door interlocked thermal magnetic circuit breaker disconnect handle, through-the-door type, and padlockable in the "Off" position.
2. Fused disconnects for each motor.
3. Trouble output contact.
4. Include a set of contacts that signal the building automation system to open VAV boxes to 100 percent during bypass mode.
5. Output filter to provide for wave shaping.
6. Provide 5 percent impedance 3-phase line reactor on the input side of the VFD.

**2.5 DISCONNECTS**

- A. Provided by Division 26, Electrical unless specified otherwise.

**PART 3 - EXECUTION**

**3.1 GENERAL**

**A. Electrical Requirements:**

1. Contractor to Provide the Following:
  - a. Motors.
  - b. Starters and disconnects that are integral parts of plumbing equipment as shown on the equipment schedules. Reference Drawings and subsequent Sections. Provide a working system. Coordinate with Division 26, Electrical.
  - c. Low Voltage and Electronic Control Devices.
  - d. Low Voltage Transformers.
  - e. Low Voltage Conduit and Wire and Connecting Devices.
  - f. Conduit and wire for electronic devices, except for line voltage wiring.



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2. Electrical work listed above performed by a licensed electrical contractor or by the control manufacturer, but provided for and coordinated under Division 22, Plumbing work. In addition, controls work supervised and subsequently approved in writing by the control manufacturer.
3. Contractor to furnish the following to the Electrical Contractor where applicable: Line voltage control equipment, including switches (except disconnects), time switches, transformers, relays, etc. (except those part of MCC).
4. Include the Following Items under Division 26, Electrical Work:
  - a. Line voltage wire and conduit system.
  - b. Disconnects not provided with equipment.
  - c. Installation of line voltage control equipment supplied by Division 22.
- B. Electrical Interlocks: Where equipment motors are to be electrically interlocked with other equipment for simultaneous operation, utilize mechanical equipment wiring diagrams to coordinate with the electrical systems so that proper wiring of the equipment involved is affected.
- C. Coordinate location of disconnect and starter or motor controller. Combination starter/disconnects may be used in lieu of separate items.
- D. Explosion-Proof Motors: UL approved and labeled for hazard classification, with over temperature protection.
- E. Provide inverter ready motors per NEMA MG1-30 for variable speed drive or soft-start starter use. Provide shaft grounding for motors over 2 HP serving variable speed drives. Provide shaft grounding and insulated bearings on motors 25 HP and larger serving variable speed drives. Shielded cable required for power wiring from variable speed drive to motor connection.
- F. Unless otherwise indicated, motors 1-HP and larger to meet/exceed NEMA Premium Efficiency and latest EPACT.
- G. Vertical in-line pump motors per NEMA MG1 vertical motor requirements.
- H. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.
- I. Check line voltage and phase and ensure agreement with nameplate.
- J. Verify motor rotation.
- K. Field Quality Control:
  1. Prepare for Acceptance Tests as Follows:
    - a. Run each motor with its controller. Demonstrate correct rotation, alignment, and speed at motor design load.



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- b. Test interlocks and control features for proper operation.
  - c. Verify that current in each phase is within nameplate rating.
- 2. Testing: Perform the Following Field Quality-Control Testing:
  - a. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.15.1. Certify compliance with test parameters.
  - b. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- 3. Manufacturer's Field Service: Engage a factory-authorized service representative to perform the following:
  - a. Inspect field-assembled components, equipment installation, and piping and electrical connections for compliance with requirements.
  - b. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
  - c. Verify bearing lubrication.
  - d. Verify proper motor rotation.
  - e. Test Reports:
    - 1) Prepare a written report to record the following test procedures used:
      - (a) Test results that comply with requirements.
      - (b) Test results that do not comply with requirements and corrective action taken to achieve compliance.
- L. Adjusting: Align motors, bases, shafts, pulleys, and belts. Tension belts according to manufacturer's written instructions.
- M. Cleaning:
  - 1. After completing equipment installation, inspect unit components. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.
  - 2. Clean motors, on completion of installation, according to manufacturer's written instructions.



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**3.2 GENERAL MOTOR CONSTRUCTION AND REQUIREMENTS**

- A. Motor Installation: Install in accordance with manufacturer's instructions. Coordinate with starter or variable speed controller with control sequence to provide necessary starter accessories.

**3.3 STARTERS**

- A. Install starters in accordance with manufacturer's instructions.
- B. Coordinate disconnect requirements and location with Division 26, Electrical if not integral to starter. If starter is installed out of line of sight of motor, provide additional disconnect at motor per code.
- C. Provide NEMA housing appropriate to installation location.
- D. Provide supports and install securely, in neat and workmanlike manner, as specified in NECA 1.
- E. Meet mounting height and accessible location requirements per local code.
- F. Provide fuses for fusible switches.
- G. Select and install overload heater elements in motor starters to match installed motor characteristics.
- H. Single phase 120 volt starter: If not furnished as single packaged controller/disconnect, provide contactors, relays, wiring, and devices necessary to match sequence of operation for equipment.

**3.4 VARIABLE FREQUENCY DRIVES**

- A. Variable Speed Controller Connection:
  - 1. Coordinate wiring length/type to meet controller manufacturer's requirements. Provide grounding per manufacturer's wiring diagram.
  - 2. Shaft Grounding:
    - a. Provide shaft grounding assembly on motors controlled by variable frequency drive. Shaft grounding device to be in the form of brush that resides on the motor shaft. Brush assembly to be capable of tolerating misalignment and maintaining rotating contact throughout the motor's life.
    - b. Material: Material used in the grounding assembly to be of stable material commonly used within industry that is not believed to constitute a hazardous material under Occupational Safety and Health Administration (OSHA) regulations.



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- c. Brushes: Specifically developed carbon compounds of sustained performance with seal life expectancy of three years minimum.
  - d. Seals: Sealed type to keep contaminants from entering the shaft grounding system in wet or severe environment applications.
  - e. Shaft Grounding Assembly: For clean room air handling systems, use the type that contains the wear products within a special enclosure within the shaft grounding system.
  - f. Shaft grounding assembly installation not to affect the motor manufacturer warranty. Where the severe environment conditions require application of the shaft grounding types that are screwed into the motor shaft, the installation of the shaft grounding system performed either by the motor manufacturer or by the motor manufacturer authorized facility.
  - g. Bond the brush to the closest ground point using code sized green insulated stranded copper conductor per manufacturer instructions.
  - h. Test and verify the performance of the assembly to ensure that under no conditions the shaft exceeds three volts.
- 3. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.
  - 4. Check line voltage and phase and ensure agreement with nameplate.
  - 5. Verify motor rotation.
- B. Ensure the area where the variable frequency drive is to be installed is within the range of ambient temperatures set by the manufacturer.
  - C. Ensure grounding and bonding is per manufacturer's recommendations.
  - D. Install per manufacturer's recommendations.
  - E. Install per NEC requirements.
  - F. Coordinate with Division 26, Electrical.

**3.5 DISCONNECTS**

- A. Provided by Division 26, Electrical unless specified otherwise.
- B. Provide disconnecting means within sight of each motor controller and of each motor. Motor controller disconnecting means equipped with lock-out/tag-out padlock provisions do not require a disconnect switch at the controlled motor location. Locate disconnect means in view of and not inside of equipment, such that tools are not needed to remove covers to access the disconnecting means.



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- C. Install in accordance with manufacturer's instructions.
- D. Install fuses in fusible disconnect switches. Coordinate fuse ampere rating with installed equipment. Do not provide fuses of lower ampere rating than motor starter thermal units.
- E. Controllers:
  - 1. Single Phase 120 Volt Starter: If not furnished as single packaged controller/disconnect, provide contactors, relays, wiring, and devices necessary to match sequence of operation for equipment.

**END OF SECTION**



**SECTION 22 05 19  
PLUMBING DEVICES**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Work Included:
  - 1. Pressure Gauges
  - 2. Thermometers
  - 3. Water Hammer Arrestors (Shock Absorbers)
  - 4. Trap Primers

**1.2 RELATED SECTIONS**

- A. Contents of Division 22, Plumbing and Division 01, General Requirements apply to this Section.

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

**1.4 SUBMITTALS**

- A. Submittals as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

**1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements apply to this Section.

**1.6 WARRANTY**

- A. Warranty of materials and workmanship as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Pressure Gauges:
  - 1. Dwyer Instruments, Inc.
  - 2. Moeller Instrument Co., Inc.
  - 3. Omega Engineering, Inc.



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4. Terice
5. Or approved equivalent.
- B. Thermometers:
  1. Ashcroft
  2. Terice
  3. Weiss
  4. Marshalltown
  5. Weksler
  6. Or approved equivalent.
- C. Water Hammer Arrestors (Shock Absorbers):
  1. Bellows Type:
    - a. Amtrol
    - b. J.R. Smith
    - c. MIFAB
    - d. Wade
    - e. Zurn
    - f. Or approved equivalent.
  2. Piston Type:
    - a. MIFAB
    - b. PPP
    - c. Sioux Chief
    - d. Or approved equivalent.
- D. Trap Primers:
  1. J.R. Smith
  2. MIFAB
  3. PPP
  4. Wade



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5. Zurn
6. Or approved equivalent.

### **2.2 PRESSURE GAUGES**

- A. Pressure Gauges: ASME B40.100, phosphor-bronze bourdon type, dry type.
  1. Case: Cast aluminum, stem-mounted, flange less.
  2. Size: 4-1/2-inch diameter.
  3. Window: Clear glass.
  4. Connector: Brass.
  5. Scale: White aluminum with black graduation and markings.
  6. Pointer: Black, adjustable.
  7. Mid-Scale Accuracy: One percent.
  8. Scale: PSI and KPa.
  9. Basis of Design: Trerice Model 600CB.

### **2.3 THERMOMETERS**

- A. Thermometers - Adjustable Angle: Red or blue appearing organic liquid in glass, ASTM E 1; lens front tube, cast aluminum case with enamel finish, cast aluminum adjustable joint with positive locking device; adjustable 360 degrees in horizontal plane, 180 degrees in vertical plane.
  1. Size: 9-inch scale.
  2. Window: Acrylic.
  3. Scale: Aluminum, white background, black graduations and markings.
  4. Stem: 3/4-inch NPT brass.
  5. Accuracy: 2 percent, per ASTM E 77.
  6. Calibration: 0-160 with 2 Degrees F graduations.
  7. Basis of Design: Trerice BX9.

### **2.4 WATER HAMMER ARRESTORS (SHOCK ABSORBERS)**

- A. Bellows-type, stainless steel casing and bellows, pressure rated, tested and certified in accordance with PDI WH-201 or ASSE 1010.



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- B. Piston-type, copper, brass or stainless steel with O-ring piston, pressure rated, tested and certified in accordance with PDI WH-201 or ASSE 1010.

### **2.5 TRAP PRIMERS**

- A. Automatic trap primer assemblies meeting governing code requirements. Provide with air-gap fittings as required.
- B. Trap seal primer valve (low lead) with integral automatic anti-siphon protection. The priming valve to discharge on pressure drop. Mifab MR-500-NPB..

## **PART 3 - EXECUTION**

### **3.1 GENERAL INSTALLATION REQUIREMENTS**

- A. For plumbing devices requiring access from access panels (i.e. trap primers, water hammer arrestors and the like) submit location/size of all access panels to Architect for approval prior to purchase and installation of access panel. See Section 22 00 00, Plumbing Basic Requirements for additional requirements.
- B. Provide instruments with scale ranges selected according to service with largest appropriate scale.
- C. Install per manufacturer recommendations.

### **3.2 PRESSURE GAUGES**

- A. Install pressure gauge where exposure to heat and vibration are minimal and where the dial can be easily read. It is also important to install the gauge in a location with undisturbed and continuous flow of the pressure medium.
- B. Provide a needle valve or gauge cock, installed between the process and the pressure gauges.
- C. Install pressure gauges in piping tee with pressure gauge cock, in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.
- D. Locations: Install in the following locations, and elsewhere as indicated.
  - 1. At each pump inlet and outlet.
  - 2. At inlet and discharge of each pressure reducing valve.
  - 3. At make-up water service outlets.
  - 4. At inlets and outlets of all master mixing valves.
- E. Adjust gauges to final angle, clean windows and lenses, and calibrate to zero.
- F. Install per manufacturer recommendations.
- G. Pressure Gauge Range/Graduations:



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1. Cold Water: 0-100 PSI; graduation 1 PSI.
2. Hot Water: 0-100 PSI; graduation 1 PSI.

### 3.3 THERMOMETERS

- A. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2-inch for installation of thermometer sockets. Ensure sockets allow clearance from insulation.
- B. Install thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.
- C. Adjust thermometers to final angle, clean windows and lenses, and calibrate to zero.
- D. Install per manufacturer recommendations.
- E. Thermometer Range/Graduations:
  1. Cold Water: 25-125 degrees F; graduation 1 degree F.
  2. Hot Water: 30-240 degrees F; graduation 2 degrees F.

### 3.4 WATER HAMMER ARRESTORS (SHOCK ABSORBERS)

- A. Install in upright position, in locations and of sizes in accordance with PDI WH-201 or ASSE 1010, and elsewhere as indicated.
- B. Locate shock absorbers in supply pipe in accordance with recommendations of Plumbing and Drainage Institute PDI-WH201 or ASSE 1010. Install ahead of solenoid operated valves. Determine size of absorber by fixture unit value of fixture supplied, using PDI symbols to designate sizes. Provide access panel for each shock absorber.
- C. Install per manufacturer recommendations.

### 3.5 TRAP PRIMERS

- A. Flush supply line prior to installation.
- B. Install valve plumb using caution to not over-tighten.
- C. Effective operating range 20 to 80 PSIG (138 to 552 kPa).
- D. Do not subject trap primer valve to pressure in excess of 125 PSI.
- E. Install trap primer per manufacturer's instructions. Install primer outlets a minimum of 12-inches above finished floor. For installations with primer lines in excess of 20 feet in length, the primer assembly should be raised 12-inches for each additional 20 feet of length. Maximum 80 feet primer length unless specifically approved by design engineer.
- F. Install primers at locations as indicated on Drawings. Extend primer lines to all trapped drains that are tied to sanitary.



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- G. Provide the number of primer assemblies required at each primer "location" to feed the number of primer lines at that location.

**END OF SECTION**

**SECTION 22 05 23  
GENERAL-DUTY VALVES FOR PLUMBING PIPING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Work Included:
  - 1. Valves, General
  - 2. Balancing Valves
  - 3. Ball Valves
  - 4. Swing Check Valves
  - 5. Thermostatic Master Mixing Valves (ASSE 1017 Rated)
  - 6. Thermostatic Point-of-Use Mixing Valves (ASSE 1070 Rated)

**1.2 RELATED SECTIONS**

- A. Contents of Division 22, Plumbing and Division 01, General Requirements apply to this Section.

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

**1.4 SUBMITTALS**

- A. Submittals as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

**1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.
- B. In addition, meet the following:
  - 1. NSF 61, Annex G and/or NSF/ANSI 372 for potable water services. Valves must be 3rd-party certified.
  - 2. ISO 9001 Certified.
  - 3. IAPMO Certified for Low Lead.
- C. Source Limitations for Valves: Obtain each type of valve from a single source and from a single manufacturer.



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- D. Model numbers indicated as Basis-of-Design indicate valve characteristics. All valves are to meet code Low Lead/Lead Free Standards.

**1.6 WARRANTY**

- A. Warranty of materials and workmanship as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Source Limitations for Valves: Obtain each type of valve from a single source and from a single manufacturer.
- B. Valves, General:
1. Apollo
  2. Armstrong
  3. ASCO
  4. Caleffi
  5. Cla-Val
  6. Conbraco
  7. Crane
  8. Clow
  9. Griswold
  10. Hammond
  11. Hays
  12. Jenkins
  13. Josam
  14. Kennedy
  15. Milwaukee
  16. Mueller
  17. Nibco
  18. Red-White Valve





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19. Smith
  20. Stockham
  21. Tour Anderson
  22. Wade
  23. Watts
  24. Wilkins
  25. Zurn
  26. Or approved equivalent.
- C. Balancing Valves:
1. Caleffi
  2. Griswold
  3. Hays
  4. Armstrong CBV
  5. Tour Anderson
  6. Or approved equivalent.
- D. Ball Valves:
1. See Valves, General above.
  2. NSF Valves:
    - a. Clow
    - b. Kennedy
    - c. Nibco
    - d. Or approved equivalent.
- E. Swing Check Valves:
1. See Valves, General above.
- F. Thermostatic Master Mixing Valves (ASSE 1017 Rated):
1. Caleffi



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2. Holby Tempering Valve
  3. Lawler Series 66
  4. Leonard Type TM
  5. Powers LFMM430 (Lead Free)
  6. Symmons Temp Control Series 5
  7. Or approved equivalent.
- G. Thermostatic Point-of-Use Mixing Valves (ASSE 1070 Rated):
1. Caleffi
  2. Lawler
  3. Leonard
  4. Powers Hydroguard
  5. Or approved equivalent.

**2.2 VALVES - GENERAL**

- A. General:
1. Sizes: Unless otherwise indicated, provide valves of same size as upstream pipe size.
  2. Operators: Provide handwheels, fastened to valve stem, for valves other than quarter-turn. Provide lever handle for quarter-turn valves 6-inches and smaller. Provide gear operators for quarter-turn valves 8-inches and larger and plug valves installed over 5-feet above finished floor.
  3. Valve Identification: Manufacturer's name (or trademark) and pressure rating clearly marked on valve body.
- B. Valves in Insulated Piping: With 2-inch stem extension and following features:
1. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation on valve without breaking the vapor seal or disturbing insulation and memory stops that are fully adjustable after insulation is applied.
- C. Valve-End Connections:
1. Flanged: With flanges according to ASME B16.1 for iron valves.
  2. Solder Joint: With sockets according to ASME B16.18.



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- 3. Threaded: With thread according to ASME B1.20.1.
- D. Valve Bypass and Drain Connections: MSS SP-45.
- E. Building Service:
  - 1. Shutoff and Isolation Valves:
    - a. Pipe Sizes 3-inches and Smaller: Ball Valve.
  - 2. Drain Service: Ball Valves.
  - 3. Strainer Blow-Off: Ball Valve.
  - 4. Check Valves: Swing.

**2.3 BALANCING VALVES**

- A. Maximum 125 PSIG System Working Water Pressure.
- B. Manual Set Balancing Valves:
  - 1. Valves are to be of the "Y" pattern, equal percentage globe-style and provide three functions:
    - a. Precise flow measurement.
    - b. Precision flow balancing.
    - c. Positive drip-tight shut-off.
  - 2. Valve to provide multi-turn, 360 degree adjustment with micrometer type indicators located on the valve handwheel. Valves have a minimum of five full 360 degree handwheel turns. 90 degree circuit-setter style ball valves are not acceptable. Valve handle to have hidden memory feature, which will provide a means for locking the valve position after the system is balanced. Valves to be furnished with precision machined venturi built into the valve body to provide highly accurate flow measurement and flow balancing. The venturi to have two 1/4-inch threaded brass metering ports with check valves and gasketed caps located on the inlet side of the valve. Valves to be furnished with flow smoothing fins downstream of the valve seat and integral to the forged valve body to make the flow more laminar. The valve body, stem and plug to be brass. The handwheel to be high-strength resin.
  - 3. 2-1/2-inch and Larger: Valves are to be of the "Y" pattern, equal percentage globe-style and provide three functions:
    - a. Precise flow measurement.
    - b. Precision flow balancing.



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- c. Positive drip-tight shut off. Valve to provide multi-turn, 360 degree adjustment with micrometer type indicators location on the valve handwheel. Valves to have a minimum of five full 360 degree handwheel turns. 90 degree circuit-setter style ball valves are not acceptable. Valve handle to have hidden memory feature, which will provide a means for locking the valve position after the system is balanced. Valve body to be either cast iron with integrated cast iron flanges (2-1/2-inch to 12-inch) or ductile iron with industrial standard grooved ends (2-1/2-inch to 12-inch). Valve stem and plug disc to be bronze with handwheel that permits multi-turn adjustments. Sizes 2-1/2-inch and 3-inch: five turns; sizes 4-inch to 6-inch: 6 turns; sizes 8-inch to 10-inch: 12 turns; and size 12-inch: 14 turns. Flange adapters to be provided to prevent rotation.

### 2.4 BALL VALVES

- A. All ball valves on brazed piping are to be three-piece.
- B. 2-1/2 Inches and Smaller: MSS SP-110, 400-600 PSI, two-piece full port ball configuration, bronze body, extended soldered ends for copper pipe and threaded ends for iron pipe, lead-free brass or stainless steel ball, lead-free brass stem, Teflon seat, extended steel handle. Apollo 77CLF 100 Series two-piece.
- C. 3 Inches and Larger: MSS SP-110, 400-600 PSI, three-piece full port ball configuration, bronze body, extended soldered ends for copper pipe and threaded ends for iron pipe, lead-free brass or stainless steel ball, lead-free brass stem, Teflon seat, extended steel handle. Apollo 82-100/82A 140 Series three-piece.
- D. Full Port Ball Valve: 2- to 4-inch ductile iron, ASTM A536, micro finish steel chrome plated or stainless steel ball and stem. TFE seats, 600 PSI.

### 2.5 SWING CHECK VALVES

- A. 2-inches and Smaller: Class 125, bronze body, horizontal swing, regrinding type, Y-pattern, renewable disc. Nibco 413. MSS SP-80.
- B. 2-1/2-inches and Larger: Class 125, iron body, bolted bonnet, horizontal swing, renewable seat and disc, flanged ends. Nibco F918. MSS SP-71.
- C. Rubber Flapper Check Valve: Horizontal or vertical upward flow installation. Working pressure to 175 PSI. Ductile iron or cast iron body. Steel reinforced Buna-N rubber flapper epoxy coating on wetted parts. MSS SP-80.
- D. Gruvlok Series 7800 Check Valve: Horizontal installation. Working pressure to 300 PSI, Type 304/302 Stainless Steel conforming to ASTM 167. Ductile body, ASTM A536, and stainless clapper, EPDM, nitrile or optional viton bumper and bonnet seals. Stainless wetted parts.

### 2.6 THERMOSTATIC MASTER MIXING VALVES (ASSE 1017 RATED)

- A. Thermostatic type with bronze body construction, corrosion resistant materials, union end stops, check inlets with strainers, 0-200 degree F dial thermometer and discharge shut-off valve. Mixing valves to meet ASSE 1017.



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- B. Maximum required delta temperature differential between hot water supply temperature and delivery temperature is 15 degrees F. Set valve outlet temperature per drawing requirements.
- C. Flow from the tempered water circulating pump to be split to mixing valve and building hot water heating system.

**2.7 THERMOSTATIC POINT-OF-USE MIXING VALVES (ASSE 1070 RATED)**

- A. Thermostatic type with bronze body construction, corrosion resistant materials, union end stops, check inlets with strainers, 0-200 degree F dial thermometer and discharge shut-off valve. Mixing valves to meet ASSE 1070.
- B. Maximum required delta temperature differential between hot water supply temperature and delivery temperature is 15 degrees F. Set valve outlet temperature per drawing requirements.

**PART 3 - EXECUTION**

**3.1 GENERAL INSTALLATION REQUIREMENTS**

- A. Prepare valves for shipping as follows:
  - 1. Protect internal parts against rust and corrosion.
  - 2. Protect threads, flange faces, grooves, and weld ends.
  - 3. Set ball valves open to minimize exposure of functional surfaces.
  - 4. Block check valves in either closed or open position.
- B. Use the following precautions during storage:
  - 1. Maintain valve end protection.
  - 2. Store valves indoors and maintain at higher than ambient dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
- C. Inspect the shipping container before unpacking to look for damage that could have occurred during transport, and report it to the transportation company immediately. After visual inspection, remove the valve from the shipping container. Make sure the faces are free of any scratches and that there is not any obvious damage to the actuator assembly or valve body.
- D. Make sure to note the valve's model number during the unpacking process. The model number will need to be provided when purchasing replacement parts.
- E. Purge and clean all piping to be connected to valve.
- F. Install per manufacturer's recommendations.



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- G. Determine that the valve and its plumbing piping is adequately supported when installed. If a valve is not adequately supported, this could prevent the valve from operating and sealing correctly. Be sure that all mating flanges are in line and parallel to minimize straining on joints and valve body.
- H. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.
- I. Do not attempt to repair defective valves; replace with new valves.
- J. Install valves where required for proper operation of piping and equipment, including valves in branch lines where necessary to isolate sections of piping. Locate valves so as to be accessible and so that separate support can be provided when necessary.
- K. Install valves with stems pointed up, in vertical position where possible, but in no case with stems pointed downward from horizontal plane unless unavoidable. Install valve drains with hose end adapter and cap on chain for each valve that must be installed with stem below horizontal plane. Ensure installation provides full stem movement.
- L. Insulation: Where insulation is indicated, install extended stem valves, arranged in proper manner to receive insulation.
- M. Mechanical Actuators: Install with chain operators where indicated. Extend chains to 5-feet above floor and hook to clips to clear aisle passage.
- N. Stem Selection: Outside screw and yoke stems, except provide inside screw, non-rising stem where space prevents full opening of OS&Y valves.
- O. Seats: Renewable seats, except where otherwise indicated.
- P. When soldering, use paste flux that are approved by the manufacturer for use with lead free alloys.
- Q. If valve applications are not indicated on Drawings, use the following:
  - 1. Shutoff Service: Ball valves.
- R. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.
- S. Valves, except wafer/butterfly types, with the following end connections:
  - 1. For Copper Tubing, 2-inches and Smaller: Threaded ends except where solder-joint valve-end.
  - 2. For Copper Tubing, 2-1/2-inches to NPS 4-inches: Flanged ends except where threaded valve-end.
  - 3. For Copper Tubing: 5-inches and Larger: Flanged ends.
  - 4. For Steel Piping, 2-inches and Smaller: Threaded ends.



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5. For Steel Piping, 2-1/2-inches to NPS 4-inches: Flanged ends except where threaded valve-end.
  6. For Steel Piping, 5-inches and Larger: Flanged ends.
- T. Valve Adjusting and Cleaning:
1. Inspect valves for leaks. Adjust or replace packing to stop leaks. Replace valve if leak persists.
  2. Valve Identification. Tag valves per Section 22 05 53, Identification for Plumbing Piping and Equipment.

### **3.2 BALANCING VALVES INSTALLATION**

- A. See General Installation Requirements above.
- B. Install with flow in the direction of the arrow on the valve body and installed at least five pipe diameters downstream from any fitting, and at least ten pipe diameters downstream from any pump. Two pipe diameters downstream from the balancing valve should be free of any fittings. When installed, easy and unobstructed access to the valve handwheel and metering ports for adjustment and measurement are to be provided. Mounting of valve in piping must prevent sediment build-up in metering ports.

### **3.3 BALL VALVES INSTALLATION**

- A. See General Installation Requirements above.

### **3.4 SWING CHECK VALVES INSTALLATION**

- A. See General Installation Requirements above.
- B. Swing Check Valve Installation: Install in horizontal position with hinge pin horizontally perpendicular to centerline of pipe. Install for proper direction of flow. Only install where there are 10 pipe diameters of straight pipe upstream of valve.
- C. Ejector and Sump Pump-Discharge Check Valves:
1. 2-inches and Smaller: Bronze swing or spring-loaded lift check valves with bronze disc.
  2. 2-1/2-inches and Larger: Rubber flapper swing check valves with lever and weight.
- D. Domestic Water and Circulation Pump Discharge Check Valves:
1. 2-inches and Smaller: Bronze body, spring loaded, lead free, lift check.
  2. 2-1/2-inches and Larger: Wafer style, silent lift check valve, lead free.



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**3.5 THERMOSTATIC MASTER MIXING VALVES (ASSE 1017 RATED) INSTALLATION**

- A. See General Installation Requirements above.
- B. Install mixing valve per manufacturer's instruction manual.

**3.6 THERMOSTATIC POINT-OF-USE MIXING VALVES (ASSE 1070 RATED) INSTALLATION**

- A. See General Installation Requirements above.
- B. Install mixing valve per manufacturer's instruction manual.

**END OF SECTION**



**SECTION 22 05 29  
HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Work Included:
  - 1. Pipe Hangers and Supports for Plumbing Piping and Equipment
  - 2. Building Attachments
  - 3. Flashing
  - 4. Miscellaneous Metal and Materials

**1.2 RELATED SECTIONS**

- A. Contents of Division 22, Plumbing and Division 01, General Requirements apply to this Section.

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.
- B. In addition, meet the following:
  - 1. ASCE 7-16, Minimum Design Loads for Buildings and Other Structures.
  - 2. Hanger spacing installation and attachment to meet all manufacturer's requirements and MSS SP-58.
  - 3. Terminology: As defined in MSS SP-90 "Guidelines on Terminology for Pipe Hangers and Supports."
  - 4. Install piping per SMACNA's requirements.

**1.4 SUBMITTALS**

- A. Submittals as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

**1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

**1.6 WARRANTY**

- A. Warranty of materials and workmanship as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.



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**1.7 PERFORMANCE REQUIREMENTS**

- A. General - Provide pipe and equipment hangers and supports in accordance with the following:
  - 1. When supports, anchorages, and seismic restraints for equipment, and supports, anchorages, and seismic restraints for piping are not shown on the Drawings, the contractor is responsible for their design.
  - 2. Connections to structural framing are not to introduce twisting, torsion, or lateral bending in the framing members. Provide supplementary steel as required.
- B. Engineered Support Systems:
  - 1. Support frames such as pipe racks or stanchions for piping and equipment which provide support from below.
  - 2. Equipment and piping support frame anchorage to supporting slab or structure.
- C. Provide channel support systems, for piping to support multiple pipes capable of supporting the combined weight of supported systems, system contents and test water.
- D. Provide heavy-duty steel trapezes for piping to support multiple pipes capable of supporting the combined weight of supported systems, system contents and test water.
- E. Provide seismic restraint hangers and supports for piping and equipment.
- F. Obtain approval from AHJ for seismic restraint hanger and support system to be installed for piping and equipment.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Pipe Hangers and Supports for Plumbing Piping and Equipment:
  - 1. Pipe Hangers/Supports:
    - a. B-Line Systems Inc.
    - b. Anvil International
    - c. HOLDRITE
    - d. Erico Co. Inc.
    - e. Snappitz Thermal Pipe Shield Manufacturing
    - f. Rilco Manufacturing Co. Inc.
    - g. Nelsen-Olson Inc.



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- h. Or approved equivalent.
- 2. Channel Support Systems:
  - a. B-Line Systems Inc.
  - b. Anvil International, Anvit-Strut
  - c. Erico Hanger Co. Inc.; O-Strut Div.
  - d. Unistrut Corp.
  - e. HOLDRITE EZ-Strut Systems
  - f. Or approved equivalent.
- 3. Thermal-Hanger Shield Inserts:
  - a. Erico Hanger Co. Inc.
  - b. Pipe Shields, Inc.
  - c. Rilco Manufacturing Co. Inc.
  - d. HOLDRITE Insulation Couplings
  - e. Or approved equivalent.
- 4. Freestanding Roof Supports:
  - a. Miro
  - b. Nelson-Olsen Inc. / Quick "Pipe" Block
  - c. Eaton / B-Line / Dura-Blok
  - d. Mifab
  - e. Or approved equivalent.
- 5. Pipe Alignment and Secondary Supports:
  - a. HOLDRITE
  - b. Starquick
  - c. Or approved equivalent.
- 6. Tank Seismic Restraint System:
  - a. HOLDRITE



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- b. Spacemaker
- 7. Wall Mounted Tank Platform:
  - a. HOLDRITE
  - b. Spacemaker
  - c. Or approved equivalent.
- 8. Floor Mount Platform:
  - a. HOLDRITE
  - b. Spacemaker
  - c. Or approved equivalent.
- B. Building Attachments:
  - 1. Anchor-It
  - 2. Gunnebo Fastening Corp.
  - 3. ITW Ramset / Red Head
  - 4. Masterset Fastening Systems, Inc.
  - 5. Or approved equivalent.
- C. Flashing:
  - 1. Fastenal
  - 2. Or approved equivalent.
- D. Miscellaneous Metal and Materials:
  - 1. See Miscellaneous Metal and Materials article below.
  - 2. Powder-Actuated Fastener Systems:
    - a. Gunnebo Fastening Corp.
    - b. Hilti, Inc.
    - c. ITW Ramset / Red Head
    - d. Masterset Fastening Systems, Inc.
    - e. Or approved equivalent.



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**2.2 PIPE HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT**

- A. Horizontal Piping Hangers and Supports - Horizontal and Vertical Piping, and Hanger Rod Attachments:
  - 1. Factory fabricated horizontal piping hangers and supports to suit piping systems in accordance manufacturer's published product information.
  - 2. Use only one type by one manufacturer for each piping service.
  - 3. Select size of hangers and supports to exactly fit pipe size for bare piping and to exactly fit around piping insulation with saddle or shield for insulated piping.
  - 4. Provide copper-plated hangers and supports for uninsulated copper piping systems.
  - 5. Provide padded pipe hangers, clamps and supports for thermoplastic piping system.
  - 6. Install no hub cast iron pipe and fittings per CISPI 301-09 Installation Procedures for Hubless Cast Iron Pipe and Fittings for Sanitary and Storm Drain Waste and Vent Piping Applications. Brace hubless cast iron pipe and fittings 5-inch and larger with HOLDRITE No Hub Pipe Restraints or approved equivalent.
- B. Pipe Hangers, Guides and Channel Systems:
  - 1. Hanger Rods: Hanger rods continuously threaded or threaded ends only in concealed spaces and threaded ends only in exposed spaces; finish electro-galvanized or cadmium-plated in concealed spaces and prime painted in exposed spaces; sizes per MSS.
  - 2. Hanger Rod Couplings: Malleable iron rod coupling with elongated center sight gap for visual inspection; to have same finish as hanger rods.
  - 3. Pipe Rings for Hanger Rods: Pipe sizes 2-inch and smaller, MSS SP Type 6 or Type 10, or approved equivalent. Pipe sizes 2-1/2-inches and larger, clevis type hangers with adjustable nuts on rod. MSS SP Type 1. Pipe rings to have same finish as hanger rods.
  - 4. Channel Type Pipe Hanging System: Framing members No. 12 gauge formed steel channels, 1-5/8-inch square, conforming to ASTM A1011 GR33; one side of channel to have a continuous slot with in-turned lips; framing nut with grooves and spring 1/2-inch size, conforming to ASTM 675 GR60; screws conforming to ASTM A307; fittings conforming to ASTM A575; parts enamel painted or electro-galvanized.
- C. Pipe Saddles and Shields:
  - 1. Factory fabricated saddles or shields under piping hangers and supports for insulated piping.



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2. Size saddles and shields for exact fit to mate with pipe insulation. 1/2 round, 18 gauge, minimum 12-inches in length (4-inch pipe and larger to be three times longer than pipe diameter).
- D. Thermal-Hanger Shield Inserts: 100-PSI (690-kPa) minimum compressive strength insulation, encased in sheet metal shield.
1. Material for Cold Piping: Water-repellent-treated, ASTM C533, Type I calcium silicate with vapor barrier.
  2. Material for Hot Piping: Water-repellent-treated, ASTM C533, Type I calcium silicate.
  3. For Trapeze or Clamped System: Insert and shield cover entire circumference of pipe.
  4. For Clevis or Band Hanger: Insert and shield to cover lower 180 degrees of pipe.
  5. Insert Length: Extend 2-inches beyond sheet metal shield for piping operating below ambient air temperature.
  6. Thermal Hanger Shield Inserts should be provided at the hanger points and guide locations on pipes requiring insulation. The Inserts should consist of Polyisocyanurate (urethane or phenolic insulation) encircling the entire circumference of the pipe with a 360 degree PVC (1.524 mm thick) with a living hinge and J lock and installed during the installation of the piping system.
- E. Concrete Inserts:
1. Malleable iron body, hot dipped galvanized finish. Lateral adjustment. MSS Type 18.
- F. Continuous Concrete Insert:
1. Steel construction, minimum 12 gauge. Electrogalvanized finish. Pipe clamps and insert nuts to match.
- G. Beam Clamps:
1. MSS Type 19 and 23, wide throat, with retaining clip.
  2. Universal Side Beam Clamp: MSS Type 20.
- H. Below Ground:
1. Pipe Hangers: Adjustable Clevis type, Federal Specification WW-H-171 (Type 1), UL listed, stainless steel Type 316. MSS Type 1. If PVC piping to be used, provide Type 1 hanger, coated for PVC piping.
  2. Rod: 5/8-inch stainless steel Type 316.
  3. Eyebolt: Stainless steel Type 316.



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- 4. Nuts and Washers: Stainless steel Type 316.
- I. Hangers for Pipe Size 2-inches and Smaller:
  - 1. Adjustable swivel ring hanger, UL listed, Type 6 or Type 10.
- J. Hangers for Pipe Size 2-1/2-inches and Larger:
  - 1. Adjustable clevis type, UL listed, Type 1.
- K. Riser Clamps:
  - 1. Steel, UL listed. MSS Type 8.
- L. Plumbers Tape:
  - 1. Not permitted as pipe hangers or pipe straps.
- M. Pipe Alignment and Secondary Support Systems:
  - 1. Secondary Pipe supports for general applications (Non-Acoustical).
    - a. Supports will be manufactured in compliance with IAPMO Product Standard PS 42-96. All products provided will be listed by IAPMO for secondary pipe support.
    - b. Supports may be used when sound and/or vibration transfer is not a concern.
  - 2. Secondary pipe supports for sound and vibration attenuation (Acoustical).
    - a. Supports will be manufactured in compliance with IAPMO Product Standard PS 42-96. All products provided will be listed by IAPMO for secondary pipe support.
    - b. Acoustical pipe supports will be manufactured and installed in compliance with International Organization for Standardization (ISO) 3822-1 with current amendments.
    - c. Supports will be used when sound and/or vibration transfer is a concern. Locations where acoustical supports will be provided and include but are not limited to partition walls between living units, tenant spaces, retail units, mechanical rooms and lobbies.
    - d. Support Products:
      - 1) Support to Wall Brace and Wall Stud Penetrations: HOLDRITE #261, #262, #263, and #264, or approved equivalent.
      - 2) Pipe Wrap for Pipe Clamps and Channel-Mounted Pipe Clamps: HOLDRITE #270, or approved equivalent.



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- 3) Pipe Wrap for Pipe Hangers: HOLDRITE #271, #272-2, and #272-4, or approved equivalent.
- 4) Drop-Ear Fitting Support: HOLDRITE #265, or approved equivalent.
- 5) Floor Riser Isolation Pads: HOLDRITE #275-T, or approved equivalent.
- 6) Floor Isolation Pads (General Applications): HOLDRITE #274, #275, #276, and #278, or approved equivalent.

**N. Freestanding Roof Pipe Supports:**

1. Polyethylene high-density UV resistant block with foam pad or 100 percent UV resistant recycled rubber. With galvanized strut/channel.

**O. Tank Seismic Restraint Systems:**

1. Constructed of galvanized or stainless steel metal with steel wall attachments meeting local seismic requirements.
2. Provide with strap tightening mechanism to ensure seismic restraint of full tank.

**P. Wall Mounted Tank Platform:**

1. Constructed of galvanized or stainless steel metal with steel support brackets and wall attachments meeting local seismic requirements.
2. Provided with welded steel, threaded drain fitting.

**Q. Floor Mount Platform:**

1. Constructed of galvanized or stainless steel metal with steel attachments meeting local seismic requirements.
2. Platforms to be rated specifically total tank system wet weight rating and size.

**2.3 BUILDING ATTACHMENTS**

- A. General:** Anchor supports to existing masonry, block and tile walls per anchoring system manufacturer's recommendations or as modified by project Structural Engineer. Provide anchor bolts suitable for cracked concrete.

**B. Anchor Bolts:**

1. Anchor Bolts (Cast-In-Place): Steel bolts, ASTM A307. Nuts to conform to ASTM A194. Design values for shear and tension not more than 80 percent of the allowable listed loads.





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2. Anchor (Expansion) Bolts: Carbon steel to ASTM A307; nut to conform to ASTM A194; drilled-in type. Design values for shear and tension not more than 80 percent of the allowable listed loads.
  3. Anchor (Adhesive) Bolts: Consisting of two-part adhesive cartridge and zinc-plated Type A307 steel anchor bolt rod assembly with ASTM A194 nut.
- C. Beam Clamps:
1. MSS Type 19 and 23, wide throat, with retaining clip.
  2. Universal Side Beam Clamp: MSS Type 20.
- D. Powder-Actuated Drive Pin Fasteners:
1. Powder-Actuated Drive-Pin Fasteners: Powder actuated type, drive pin attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.
- E. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.
- F. Grout: ASTM C1107, Grade B, factory mixed and packaged, non-shrink and nonmetallic, dry, hydraulic-cement grout.
1. Characteristics: Post hardening and volume adjusting; recommended for both interior and exterior applications.
  2. Properties: Non-staining, noncorrosive, and non-gaseous.
  3. Design Mix: 5000-PSI (34.5-MPa), 28-day compressive strength.

**2.4 FLASHING**

- A. Steel Flashing: 26 gauge galvanized steel.
- B. Safes: 8 mil thick neoprene.
- C. Caps: Steel, 22 gauge minimum, 16 gauge at fire-resistant structures.
- D. Provide hot dipped galvanized components for items exposed to weather.

**2.5 MISCELLANEOUS METAL AND MATERIALS**

- A. Miscellaneous Metal: Provide miscellaneous metal items specified hereunder, including materials, fabrication, fastenings and accessories required for finished installation, where indicated on Drawings or otherwise not shown on drawings, that are necessary for completion of the project. The Contractor is responsible for their design.
  1. Fabricate miscellaneous units to size, shapes and profiles indicated or, if not indicated, of required dimensions to receive adjacent other work to be retained by framing. Except as otherwise shown, fabricate from structural steel shapes



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and plates and steel bars, of welded construction using mitered joints for field connection. Cut, drill and tap units to receive hardware and similar items.

- B. Structural Shapes: Where miscellaneous metal items are needed to be fabricated from structural steel shapes and plates, provide members constructed of steel conforming with requirements of ASTM A36 or approved equivalent.
- C. Steel Pipe: Provide seamless steel pipe conforming to requirements of ASTM A53, Type S, Grade A, or Grade B. Weight and size required as specified.
- D. Fasteners: Provide fasteners of types as required for assembly and installation of fabricated items; surface-applied fasteners are specified elsewhere.
- E. Bolts: Low carbon steel externally and internally threaded fasteners conforming with requirements of ASTM A307; include necessary nuts and plain hardened washers. For structural steel elements supporting mechanical material or equipment from building structural members or connection thereto, use fasteners conforming to ASTM A325.
- F. Miscellaneous Materials: Provide incidental accessory materials, tools, methods and equipment required for fabrication.
- G. Provide hot dipped galvanized components for items exposed to weather.
- H. Use straps, threshold rods and wire with sizes required by SMACNA to support piping.
- I. Grout: ASTM C1107, Grade B, factory mixed and packaged, non-shrink and nonmetallic, dry, hydraulic-cement grout.
  - 1. Characteristics: Post hardening and volume adjusting; recommended for both interior and exterior applications.
  - 2. Properties: Non-staining, noncorrosive, and non-gaseous.
  - 3. Design Mix: 5000-PSI (34.5-MPa), 28-day compressive strength.

**PART 3 - EXECUTION**

**3.1 GENERAL INSTALLATION REQUIREMENTS**

- A. Examination:
  - 1. Verify building materials to have hangers and attachments affixed in accordance with hangers to be used. Provide supporting calculations.
- B. Preparation:
  - 1. Examine Drawings and coordinate for verification of exact locations of fire and smoke rated walls, partitions, floors and other assemblies. Indicate, by shading and labeling on Record Drawings such locations and label as "1-Hour Wall," "2-Hour Fire/Smoke Barrier," and the like. Determine proper locations for piping penetrations. Set sleeves in place in new floors, walls or roofs prior to concrete pour or grouting.



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- C. Install hangers, supports, anchors and sleeves after required building structural work has been completed in areas where the work is to be installed. Coordinate with project structural engineer proper placement of inserts, anchors and other building structural attachments.

**3.2 PIPE HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT**

- A. Hangers and Supports:
1. Comply with MSS SP-58. Pipe Hanger and Support Installation: Install hangers, supports, clamps, and attachments as required to properly support piping from building structure. For horizontally hung grooved-end piping, provide a minimum of 2 hangers per pipe section.
  2. Pipe Ring Diameters:
    - a. Uninsulated and Insulated Pipe, except where oversized pipe rings are specified: Ring inner diameter to suit pipe outer diameter.
    - b. Insulated Piping Where Oversized Pipe Rings are Specified and Vibration Isolating Sleeves: Ring inner diameter to suit outer diameter of insulation or sleeve.
  3. Oversize Pipe Rings: Provide oversize pipe rings of 2-inch and larger size.
  4. Pipe Support Brackets: Support pipe with pipe slides.
  5. Steel Backing in Walls: Provide steel backing in walls to support fixtures and piping hung from steel stud walls.
  6. Channel Support System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled channel systems.
    - a. Field assemble and install according to manufacturer's written instructions.
  7. Heavy-Duty Steel Trapeze Installation: Arrange for grouping of parallel runs of horizontal piping and support together on field -fabricated, heavy-duty trapezes.
    - a. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
    - b. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D-1.1
  8. Group parallel runs of horizontal piping to be supported together on trapeze-type hangers.
  9. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe.



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10. Do not support piping from other piping.
11. Fire protection piping will be supported independently of other piping.
12. Prevent electrolysis in support of copper tubing by use of hangers and supports which are copper plated.
13. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers and other accessories.
14. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchor, and to facilitate the action of expansion joints, expansion loops, expansion bends and similar units.
15. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
16. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9, "Building Services Piping" is not exceeded.
17. Insulated Piping (comply with the following):
  - a. Attach clamps and spacers to piping.
    - 1) Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    - 2) Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    - 3) Do not exceed pipe stress limits according to ASME B31.9.
  - b. Install MSS SP-58, Type 39 protection saddles, if insulation without a vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
    - 1) Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN100) and larger if pipe is installed on rollers.
  - c. Install MSS SP-58, Type 40 protective shields on cold piping having a vapor barrier. Shields to span arc of 180 degrees.
    - 1) Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN100) and larger if pipe is installed on rollers.
  - d. Shield Dimensions for Pipe, not less than the following:



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- 1) NPS 1/4 to NPS 3-1/2 (DN8 to DN 90): 12-inches long and 0.048-inch thick.
  - 2) NPS 4 (DN100): 12-inches long and 0.06-inch thick.
  - 3) NPS 5 and NPS 6 (DN125 and DN150): 18-inches long and 0.06-inch thick.
  - 4) NPS 8 to NPS 14 (DN200 to DN350): 24-inches long and 0.075-inch thick.
  - 5) NPS 16 to NPS 24 (DN400 to DN600): 24-inches long and 0.105-inch thick.
- e. Pipes NPS 8 (DN200) and Larger: Include wood inserts.
- f. Insert Material: Length at least as long as protective shield.
- g. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.
18. Equipment Clearances: Do not route equipment or piping through electrical rooms, transformer vaults, elevator equipment rooms, IT rooms, MPOE rooms, or other electrical or electronic equipment spaces and enclosures and the like. Within equipment rooms, provide minimum 3-feet lateral clearance from all sides of electric switchgear panels. Do not route piping or equipment above any electric power or lighting panel, switchgear, or similar electric device. Coordinate with Electrical and coordinate exact equipment or pipe routing to provide proper clearance with such items.
19. Pipe supports and hanger spacing (pipe supported from structure or floor-supported) to meet the requirements of References and Standards Article in Part 1 above.
- B. Pipe Curb Assemblies:
1. Provide for piping which penetrates the structural roof deck to service equipment above the roof level (e.g., piping, electrical power and control wiring). Meet requirements of roof warranty.
  2. Provide prefabricated units for roof membrane and insulation penetrations related to equipment. Coordinate with roofing system. Set supports on the structural deck. Do not set supports on insulation or roofing. Provide level supports by prefabricated pitch built into the curb.
  3. Piping above roof to be supported with freestanding roof pipe supports unless detailed otherwise. At roofing applications, the adhesion mastic is to be specifically submitted to and approved by the roofing system manufacturer/installer to maintain the integrity of all warranties.
  4. At concrete floors, install a polyurethane mastic to the support block and adhere in place.



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- C. Vertical Piping:
  - 1. Support with U-clamps fastened to wall to hold piping away from wall unless otherwise approved.
  - 2. Riser clamps to be directly under fitting or welded to pipe. Provide neoprene pads for all systems except natural gas.
  - 3. Riser to be supported at each floor penetration.
  - 4. Provide structural steel supports at the base of pipe risers. Size supports to carry forces exerted by piping system when in operation.
- D. Adjusting and Painting:
  - 1. Adjust hangers so as to distribute loads equally on attachments. Provide grout under supports to bring piping and equipment to proper level and elevations.
  - 2. Prime paint ferrous nongalvanized hangers, accessories, and supplementary steel which are not factory painted.
- E. Tank Seismic Restraint Systems:
  - 1. Install restraint system per manufacturer's instructions.
  - 2. Coordinate system attachments to building structure with structural engineer and complete installation in accordance with engineers' requirements.
- F. Wall Mounted Tank Platform:
  - 1. Install restraint system per manufacturer's instructions.
  - 2. Coordinate system attachments to building structure with structural engineer and complete installation in accordance with engineers' requirements.
- G. Floor Mount Platform:
  - 1. Install restraint system per manufacturer's instructions.
  - 2. Coordinate system attachments to building structure with structural engineer and complete installation in accordance with engineers' requirements.

**3.3 BUILDING ATTACHMENTS**

- A. Install within concrete slabs or attach to structural steel or wood. Install additional building attachments where support is required for additional concentrated loads, including valves, flanges, guides, strainers, expansion joints and at changes in direction of piping.
- B. Attachment to Wood Structure: Provide MSS Type 34 for attachment to wooden beam or approved attachment for a wood structure.



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- C. Install mechanical-anchor fasteners in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- D. Install concrete inserts before concrete is placed; fasten insert secure to forms. Where concrete with compressive strength less than 2500 PSI is indicated, install reinforcing bars through openings at top in inserts.
- E. Install powder-actuated drive pin fasteners in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual. Test powder-actuated insert attachments with a minimum load of 100 pounds.
- F. Bolting: Provide bored, drilled or reamed holes for bolting to miscellaneous structural metals, frames or for mounts or supports. Flame cut, punched or hand sawn holes will not be accepted.
- G. Anchor Bolts:
  - 1. Install anchor bolts for mechanical equipment and piping as required. Tightly fit and clamp base-supported equipment anchor bolts at equipment support points. Provide locknuts where equipment and piping are hung.
  - 2. Anchor Bolts (Cast-In-Place): Embed anchor bolts in new cast-in-place concrete to anchor equipment. Install a pipe sleeve around the anchor bolt for adjustment of the top 1/3 of the bolt embedment; sizes and patterns to suit the installation conditions of the equipment to be anchored.
- H. Pipe Anchors: Provide anchors to fasten piping which is subject to expansion and contraction, and adjacent to equipment to prevent loading high forces onto the equipment.
- I. Escutcheon Plates: Install around horizontal and vertical piping at visible penetrations through walls, partitions, floors, or ceilings, including penetrations through closets, through below ceiling corridor wall, and through equipment room walls and floors.
- J. Installation of metallic or plastic piping penetrations through non fire-rated walls and partitions and through smoke-rated walls and partitions:
  - 1. Install fabricated pipe sleeve.
  - 2. After installation of sleeve and piping, tightly pack entire annular void between piping or piping insulation and sleeve identification with specified material.
  - 3. Seal each end airtight with a resilient nonhardening UL listed fire resistant ASTM 814 sealant.
- K. Piping Penetrations Through Fire-Rated (1 to 3 hour) Assemblies:
  - 1. Select and install pre-engineered pipe penetration system in accordance with the UL listing and manufacturer's recommendation.



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- 2. Provide proper sizing when providing sleeves or core-drilled holes to accommodate the penetration. Firestop voids between sleeve or core-drilled hole and pipe passing through to meet the requirements of ASTM E814. Use HOLDRITE HydroFlame or approved equivalent.
- L. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers and other accessories.

**3.4 FLASHING**

- A. Flash and counter flash where piping passes through weather or waterproofed walls, floors and roofs.
- B. Flash vent soil pipes with flashings per Division 01, General Requirements.
- C. Flash floor drains over finished areas and roof drains, 10-inches clear on sides, minimum 36-inches by 36-inches sheet size. See Division 01, General Requirements. Fasten flashing to drain with clamping device.
- D. Install built up fixtures (mop sinks, shower stalls, shower floors) with water sealing systems/membranes to meet Code and as prescribed by Division 01, General Requirements and Section 22 00 00, Plumbing Basic Requirements. Meet all Code testing requirements. Provide drainage devices with appropriate flanges, clamps, etc. to meet these installation requirements and ensure a water-tight installation.

**3.5 MISCELLANEOUS METAL AND MATERIALS**

- A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions and directions for installation of anchorages, such as concrete inserts, sleeves, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.
- B. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; including, threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws and other connectors as required. Avoid cutting concrete reinforcing when drilling for inserts. Reference structural drawings and reinforcing shop drawings and determine locations of stirrups prior to drilling into concrete.
- C. Cutting, Fitting and Placement: Perform cutting, drilling and fitting required for installation of miscellaneous metal fabrications. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items which are to be built into concrete masonry or similar construction.
- D. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, and methods used in correcting welding work.
- E. Setting Loose Plates: Clean concrete and masonry bearing surfaces of any bond reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.





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1. Set loose leveling and bearing plates on wedges or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut-off flush with edge of the bearing plate before packing with grout. Use metallic non-shrink grout in concealed locations where not exposed to moisture; use non-metallic non-shrink grout in exposed locations, unless otherwise indicated.
2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

**F. Fabrication:**

1. General: Verify dimensions prior to fabrication. Form metal items to accurate sizes and configurations as indicated on Drawings and otherwise required for proper installation; make with lines straight and angles sharp, clean and true; drill, countersink, tap, and otherwise prepare items for connections with work of other trades, as required. Fabricate to detail of structural shapes, plates and bars; weld joints where practicable; provide bolts and other connection devices required. Include anchorages; clip angles, sleeves, anchor plates and similar devices. Hot dip galvanize after fabrication items installed in exterior locations. Set accurately in position as required and anchor securely to building construction. Construct items with joints formed for strength and rigidity, accurately machining for proper fit; where exposed to weather, form to exclude water.
2. Finishes:
  - a. Ferrous Metal: After fabrication, but before erection, clean surfaces by mechanical or chemical methods to remove rust, scale, oil, corrosion, or other substances detrimental to bonding of subsequently applied protective coatings. For metal items exposed to weather or moisture, galvanize in manner to obtain G90 zinc coating in accordance with ASTM A123. Provide other non-galvanized ferrous metal with 1 coat of approved rust-resisting paint primer, in manner to obtain not less than 1.0 mil dry film thickness. Touch-up damaged areas with primer of same material before installation. Apply zinc coatings and paint primers uniformly and smoothly; leave ready for finish painting as specified elsewhere.
  - b. Metal in contact with Concrete, Masonry and Other Dissimilar Materials:
    - 1) Where metal items are to be erected in contact with dissimilar materials, provide contact surfaces with coating of an approved zinc-chromate primer in manner to obtain not less than 1.0 mil dry film thickness, in addition to other coatings specified in these specifications.
  - c. For Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and apply galvanizing repair paint to comply with ASTM A780.



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**G. Metal Fabrication:**

1. Cut, drill, and fit miscellaneous metal fabrications for heavy-duty steel trapezes and equipment supports.
2. Fit exposed connections together to form hairline joints. Field-weld connections that cannot be shop-welded because of shipping size limitations.
3. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of weld and methods used in correcting welding work, and with the following:
  - a. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - b. Obtain fusion without undercut or overlap.
  - c. Remove welding flux immediately.
  - d. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.
4. Provide hot dipped galvanized components for items exposed to weather.

**END OF SECTION**

**SECTION 22 05 48**  
**VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT**

**PART 1 - GENERAL**

**1.1 SUMMARY**

A. Work Included:

1. Seismic Bracing/Restraint Devices/Systems for Equipment and Piping

**1.2 RELATED SECTIONS**

A. Contents of Division 22, Plumbing and Division 01, General Requirements apply to this Section.

1. Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment
2. Section 22 30 00 - Plumbing Equipment

**1.3 REFERENCES AND STANDARDS**

A. References and standards as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

**1.4 SUBMITTALS**

A. Submittals as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

B. In addition, provide:

1. Seismic Restraint:
  - a. Shop Drawings: Show compliance with requirements of Quality Assurance article of this Section. Shop Drawings will be stamped by professional structural engineer licensed in state of California.
  - b. Calculations: Submit seismic calculations indicating restraint loadings resulting from design seismic forces. Include anchorage details. Calculations will be certified by professional structural engineer licensed in the state of California.
  - c. Certifications: For restraining devices submit pre-approval certification number from government agency. Where pre-approval is not available, submit testing performed by independent laboratory or calculations sealed by professional structural engineer licensed in state of California certifying isolators and restraints will withstand seismic forces encountered.



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**1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.
- B. In addition, meet the following:
  - 1. Seismic Restraint:
    - a. Seismic restraint and anchorage of permanent equipment and associated systems listed below to building structure will be designed to resist total design seismic force prescribed in local building code:
      - 1) Floor- or roof-mounted equipment weighing 400 pounds or greater.
      - 2) Suspended, wall-mounted or vibration isolated equipment weighing 20 pounds or greater.
      - 3) Housekeeping slabs: provide reinforcement and anchorage to building structure.
    - b. Where required, seismic sway bracing of suspended piping will meet the following:
      - 1) Pipe runs requiring seismic bracing will have a minimum of two traverse braces and one longitudinal brace. A longitudinal (or a traverse) brace at 90 degree change in direction may act as traverse (or longitudinal) brace if located within 2-feet of change in direction.
      - 2) Seismic bracing may not pass through seismic separation joint. Pipe runs that pass through seismic separation joints must be restrained within 5-feet of both sides of the separation.
      - 3) Seismic brace assembly spacing will not exceed 40-feet transverse and 80-feet longitudinal.
    - c. Seismic sway bracing of suspended piping will be performed for the following:
      - 1) Piping 8-inches nominal diameter and larger and trapeze systems where total area of pipe exceeds 28 square inches.
      - 2) Piping 2-1/2-inches nominal diameter and larger and trapeze systems where total area of pipe exceeds 3 square inches.
      - 3) Piping 4-inches nominal diameter and larger, all cast iron and PVC piping and trapeze systems with total aggregate weight of 10 pounds/foot or greater.



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- 4) Piping 1-1/4-inches nominal diameter and larger and trapeze systems with total aggregate weight of 10 pounds/foot or greater.
- d. Seismic restraints may be omitted from suspended piping if the following conditions are satisfied:
  - 1) For piping supported by individual rod hangers 12-inches or less in length from top of pipe to bottom of structural support. Top connections to structure will have swivel joints, eye bolts, or vibration isolation hangers for the entire length of the system run.
  - 2) Lateral motion of the system will not cause damaging impact with surrounding systems or cause loss of system vertical support.
  - 3) System must be welded steel pipe, brazed copper pipe, or similar ductile material with ductile connections.
- e. Seismic restraints, including anchors to building structure, will be designed by registered professional structural engineer licensed in state of California. Design will include:
  - 1) Number, size, capacity, and location of anchors for floor- or roof-mounted equipment. For curb-mounted equipment, provide design of attachment of both unit to curb and curb to structure.
  - 2) Number, size, capacity, and location of seismic restraint devices and anchors for vibration-isolation and suspended equipment. Provide calculations, test data verifying the horizontal and vertical ratings of the seismic restraint devices.
  - 3) Number, size, capacity, and location of braces and anchors for suspended piping and ductwork on as-built plan drawings.
  - 4) Maximum seismic loads will be indicated on Drawings at each brace location. Drawings will bear stamp and signature of registered professional structural engineer who designed layout of braces.

**1.6 WARRANTY**

- A. Warranty of materials and workmanship as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Seismic Bracing/Restraint Devices/Systems for Equipment and Piping:
  - 1. Amber-Booth.



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2. California Dynamics Corporation.
3. Cooper B-Line, Inc.
4. Hilti, Inc.
5. Mason Industries, Inc.
6. Kinetics Noise Control.
7. Unistrut.
8. ISAT, Inc.
9. Or approved equivalent.

**2.2 SEISMIC BRACING/RESTRAINT DEVICES/SYSTEMS FOR EQUIPMENT AND PIPING**

- A. General Requirements for Restraint Components: Rated strengths, features, and applications will be as defined in reports by agency acceptable to authorities having jurisdiction.
- B. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components will be at least four times the maximum seismic forces to which they will be subjected.
- C. Anchor bolts for attaching to concrete will be seismic-rated, drill-in, and stud-wedge or female-wedge type. Provide anchor bolts suitable for cracked concrete.
- D. Resilient Isolation Washers and Bushings: Oil- and water-resistant neoprene.
- E. Maximum 1/4-inch air gap, and minimum 1/4-inch thick resilient cushion.

**PART 3 - EXECUTION**

**3.1 INSTALLATION**

- A. General:
  1. Vibration isolators and seismic restraint systems must be installed in strict accordance with manufacturers written instructions and certified submittal data.
  2. Set floor-mounted equipment on minimum 4-inch-high concrete housekeeping pads. Extend pad at least 6-inches beyond footprint of equipment in each direction.
  3. Provide mounts for equipment installed outdoors for wind loads of 30-pounds psf applied to any exposed surface of isolated equipment.



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4. Do not install equipment or pipe which makes rigid contact with building slabs, beams, studs, walls, etc.
5. Anchor baseplate to floor or structure. Provide rubber grommets and washers to isolate bolt from base plate. Under no circumstances will isolation efficiency be destroyed when bolting the isolators to floor.
6. Building Penetrations: Isolate water piping penetrating wall, ceilings, floors or shafts from the structure by piping isolator or by 3/8-inch thick foamed rubber insulation. Install units flush with finished structure face, using one for each side as required. Cut units to length if longer than structure thickness. Caulk around pipe at equipment room wall.
7. Pipe Hangers in Equipment Rooms: Support water and gas piping connected to rotating equipment within equipment rooms on spring and neoprene hangers. The first three hangers from a piece of vibrating equipment are to have a minimum of 1/2 static deflection of equipment isolators. Other isolators should have a minimum of 1/4 static deflection of equipment isolators.

**3.2 SEISMIC RESTRAINTS**

- A. General:
  1. Install and adjust seismic restraints so that equipment and piping supports are not degraded by restraints.
  2. Restraints must not short circuit vibration isolation systems or transmit objectionable vibration or noise.
- B. Supported Equipment: Each vibration isolation frame for supported equipment will have a minimum of four seismic snubbers mounted as close as possible to vibration isolators and/or frame extremities.
- C. Bracing of Pipes: Branch lines may not be used to brace main lines.
- D. Suspended Equipment and Piping Cable Method:
  1. Cables will be adjusted to the degree of slackness approved by Structural Engineer of Record.
  2. Uplift and downward restraint nuts and washers for Type 5 spring hangers will be adjusted so that there is a minimum 1/4-inch clearance.
- E. Vibration isolators and seismic restraint systems must be installed in strict accordance with manufacturers written instructions and certified submittal data.

**END OF SECTION**

**SECTION 22 05 53**  
**IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Work Included:
  - 1. Plastic Nameplates
  - 2. Tags
  - 3. Plastic Pipe Markers

**1.2 RELATED SECTIONS**

- A. Contents of Division 22, Plumbing and Division 01, General Requirements apply to this Section.

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

**1.4 SUBMITTALS**

- A. Submittals as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.
- B. In addition, submit Valve Schedule for each piping system, in tabular format using Microsoft Word or Excel software. Tabulate valve number, piping system, system abbreviation (as shown on tag), location of valve (room or space), and variations for identification (if any). Mark valves which are intended for emergency shutoff and similar special uses by special "flags" in margin of schedule. In addition to mounted copies, furnish extra copies for maintenance manuals. Provide schedules organized as follows:
  - 1. Equipment Type:
    - a. Identification:
    - b. Background:
      - 1) Size:
      - 2) Color:
    - c. Lettering:
      - 1) Size:
      - 2) Color:





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**1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.
- B. In addition, meet the following:
  - 1. Manufacturer's Qualifications: Firms regularly engaged in manufacture of identification devices of types and sizes required.
  - 2. Codes and Standards: Comply with ANSI A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices unless otherwise indicated.

**1.6 WARRANTY**

- A. Warranty of materials and workmanship as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. General: Manufacturer's standard products of categories and types required for each application as referenced in other Division 22, Plumbing Sections. Where more than a single type is specified for application, provide single selection for each product category.
- B. Plastic Nameplates:
  - 1. Brady Corporation
  - 2. Or approved equivalent.
- C. Tags:
  - 1. Brady Corporation
  - 2. Brimar
  - 3. Champion America Inc.
  - 4. Craftmark
  - 5. Seton Identification Products
  - 6. Or approved equivalent.
- D. Plastic Pipe Markers:
  - 1. Brady Corporation
  - 2. Brimar



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3. Champion America Inc.
4. Craftmark
5. Seton Identification Products
6. Or approved equivalent.

**2.2 PLASTIC NAMEPLATES**

- A. Description: Engraving stock melamine plastic laminate 1/8-inch thick, engraved with engraver's standard letter style of the sizes and wording indicated.
  1. Letter Color: White.
  2. Letter Height: 1/2 inch.
  3. Background Color: Black.
  4. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate the substrate.
  5. Access Panel Markers: Manufacturer's standard 1/16-inch thick engraved plastic laminate access panel markers, with abbreviations and numbers corresponding to concealed valve or devices/equipment. Include center hole to allow attachment.
  6. Signage for hot water outlets on 140 degree F hot water systems not protected by ASSE 1070 mixing valves; hose bibbs, janitor sinks, and fixtures used by trained personnel.
    - a. Manufacturer's standard 1/8-inch thick engraved plastic laminate signage 4 by 4-inches.
    - b. Letter Color: Red.
    - c. Letter Height: 1/2 inch.
    - d. Background Color: White.
    - e. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate the substrate.

**2.3 TAGS**

- A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2-inch diameter.
- B. Metal Tags: Polished Brass with stamped letters; tag size minimum 1-1/2-inch diameter with smooth edges.



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- C. Valve designations to be coordinated with existing valve identifications to ensure no repetitive designations are utilized.
- D. Chart/Schedules: Valve Schedule Frames. For each page of a valve schedule, provide glazed display frame with removable mounting as appropriate for wall construction upon which frame is to be mounted. Provide frames of finished hardwood or extruded aluminum, with SSB-grade sheet glass.
- E. Valve Tag Fasteners: Solid brass chain (wire link or beaded type), or solid brass S-hooks.
- F. Warning Tags: Preprinted or partially preprinted, accident-prevention tags; of plasticized card stock with matte finish suitable for writing.
  - 1. Size: Approximately 4- by 7-inches.
  - 2. Fasteners: Brass grommet and wire.
  - 3. Nomenclature: Large-size primary caption such as DANGER, CAUTION, or DO NOT OPERATE.
  - 4. Color: Yellow background with black lettering.

**2.4 PLASTIC PIPE MARKERS**

- A. Color: Conform to ASME A13.1 and ANSI Z535.1.
- B. Plastic Pipe Markers (for external diameters of 6-inches and larger including insulation): Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
- C. Plastic Tape Pipe Markers (for external diameters less than 6-inches including insulation): Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings. Minimum information indicating flow direction arrow and identification of fluid being conveyed.

**PART 3 - EXECUTION**

**3.1 GENERAL INSTALLATION REQUIREMENTS**

- A. Lettering and Graphics:
  - 1. General: Coordinate names, abbreviations and other designations used in plumbing identification work with corresponding designations shown, specified or scheduled. Provide numbers, lettering and wording as indicated or, if not otherwise indicated, as recommended by manufacturers or as required for proper identification and operation/maintenance of mechanical systems and equipment.
  - 2. Multiple Systems: Where multiple systems of same generic name are shown and specified, provide identification which indicates individual system number as well as service (as examples: Chiller No. 3, Air Handling Unit No. 42, Standpipe F12, and the like).



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- B. Preparation: Degrease and clean surfaces to receive adhesive for identification materials.
- C. Coordination: Where identification is to be applied to surfaces which require insulation, painting or other covering or finish, including valve tags in finished mechanical spaces, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.
- D. Install valve schedule at each mechanical room.
- E. Access Doors: Provide markers on each access door and housings, indicating purpose of access (to what equipment) and other maintenance and operating instructions.

**3.2 PLASTIC NAMEPLATES**

- A. Identify pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates riveted to equipment body.
- B. Identify control panels and major control components outside panels with plastic nameplates riveted to equipment body.
- C. Install plastic nameplates with corrosive-resistant mechanical fasteners.

**3.3 TAGS**

- A. Small devices, such as in-line pumps, may be identified with tags. Use metal tags on piping 3/4-inch diameter and smaller.
- B. Identify valves in main and branch piping with metal tags. Indicate valve function and the normally open or closed positions on the valve tag.
- C. Coordinate with the facility maintenance personnel to ensure consistency with the existing tagging system.
- D. Tag balancing valves with balanced GPM or CFM indicated after balancing is completed and accepted.
- E. Install tags with corrosion resistant chain.

**3.4 PLASTIC PIPE MARKERS**

- A. Install plastic pipe markers in accordance with manufacturer's instructions.
- B. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- C. For exterior underground piping installations, install underground plastic pipe markers with tracer wire 6- to 8-inches below finished grade directly above buried pipe.
- D. Identify piping, concealed or exposed, with plastic tape pipe markers. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20-feet (reduced to 10-feet in congested areas and mechanical equipment rooms) on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each



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obstruction. Locate near branches, valves, control devices, equipment connections, access doors, floor/wall penetrations.

**END OF SECTION**

**SECTION 22 05 93  
TESTING, ADJUSTING, AND BALANCING FOR PLUMBING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Balancing water flow within distribution systems of all Division 22, Plumbing Sections, including sub-mains, branches, and terminals, to indicated quantities according to specified tolerances.
- B. Adjusting plumbing systems to provide indicated quantities.
- C. Verifying that automatic control devices are functioning properly.
- D. Reporting results of the activities and procedures specified in this Section.

**1.2 RELATED SECTIONS**

- A. Contents of Division 22, Plumbing and Division 01, General Requirements apply to this Section.

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

**1.4 SUBMITTALS**

- A. Submittals as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

**1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.
- B. In addition, meet the following:
  - 1. Acceptable Balance Firm:
    - a. General:
      - 1) Procure services of independent Testing, Adjusting, and Balancing (TAB) agency to balance, adjust and test water circulating. Minimum Experience: 5 years.
    - b. Industry Standards: Testing and Balancing will conform to NEBB, American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE), and American National Standards Institute (ANSI) as follows:



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- 1) NEBB: Comply with Procedural Standards for Testing, Adjusting Balancing of Environmental Systems.
- 2) ASHRAE: Comply with recommendations pertaining to measurements, instruments, and TAB.
- c. Test Observation: If requested, conduct tests in the presence of the Architect or the Architect's representative.
2. Provide proof of testing agency having successfully completed at least five projects of similar size and scope.
3. Code Compliance: Perform tests in the presence of the Authority Having Jurisdiction (AHJ) where required by the Authority Having Jurisdiction (AHJ).
4. Owner Witness: Perform tests in the presence of the Owner's representative.
5. Engineer Witness: The engineer or engineer's representative reserves the right to observe tests or selected tests to assure compliance with the specifications.
6. Simultaneous Testing: Test observations by the Authority Having Jurisdiction (AHJ), the Owner's Authorized Representative and the engineer's representative need not occur simultaneously.
7. Do not perform TAB work until plumbing equipment has been completely installed and is operating continuously as required.
8. Conduct TAB with clean filters in place. Clean strainers prior to performing TAB.
9. Agent Qualifications: Engage a TAB Agent certified by AABC or NEBB.
10. TAB Conference: Meet with the Owner's and the Architect's representatives on approval of the TAB strategies and procedures plan to develop a mutual understanding of the details. Ensure the participation of TAB team members, equipment manufacturers' authorized service representatives, controls Installer, and other support personnel. Provide 7 days advance notice of scheduled meeting time and location.
  - a. Agenda Items: Include at least the following:
    - 1) Submittal distribution requirements.
    - 2) TAB plan.
    - 3) Work schedule and Project site access requirements.
    - 4) Coordination and cooperation of trades and subcontractors.
    - 5) Coordination of documentation and communication flow.



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11. Certification of TAB Reports: Certify the TAB field data reports. This certification includes the following:
  - a. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
  - b. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.
12. TAB Reports: Use standard forms from AABC's "National Standards for Testing, Adjusting, and Balancing."
13. TAB Reports: Use standard forms from NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."
14. Instrumentation Type, Quantity, and Accuracy: As described in AABC national standards.
15. Instrumentation Type, Quantity, and Accuracy: As described in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems," Section II, "Required Instrumentation for NEBB Certification."
16. Instrumentation Calibration: Calibrate instruments at least every 6 months or more frequently if required by the instrument manufacturer.

**1.6 WARRANTY**

- A. Warranty of materials and workmanship as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

**1.7 DEFINITIONS**

- A. Adjust: To regulate fluid flow rate at the equipment.
- B. Balance: To proportion flows within the distribution system, including sub mains, branches, and terminals, according to design quantities.
- C. Procedure: An approach to and execution of a sequence of work operations to yield repeatable results.
- D. Report Forms: Test data sheets for recording test data in logical order.
- E. Static Head: The pressure due to the weight of the fluid above the point of measurement. In a closed system, static head is equal on both sides of the pump.
- F. Suction Head: The height of fluid surface above the centerline of the pump on the suction side.
- G. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.





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- H. System Effect Factors: Allowances used to calculate a reduction of the performance ratings of a fan when installed under conditions different from those presented when the fan was performance tested.
- I. TAB: Testing, Adjusting, and Balancing.
- J. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.
- K. Test: A procedure to determine quantitative performance of a system or equipment.
- L. Testing, Adjusting, and Balancing (TAB) Agent: The entity responsible for performing and reporting the TAB procedures.
- M. AABC: Associated Air Balance Council.
- N. AMCA: Air Movement and Control Association.
- O. CTI: Cooling Tower Institute.
- P. NEBB: National Environmental Balancing Bureau.
- Q. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association.

**1.8 COORDINATION**

- A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, controls installers, and other mechanics to operate systems and equipment to support and assist TAB activities.
- B. Notice: Provide 7 days advance notice for each test. Include scheduled test dates and times.
- C. Perform TAB after leakage and pressure tests on piping distribution systems have been satisfactorily completed.

**PART 2 - PRODUCTS - NOT USED**

**PART 3 - EXECUTION**

**3.1 PROJECT CONDITIONS**

- A. Full Owner Occupancy: The Owner will occupy the site and existing building during the entire TAB period. Cooperate with the Owner during TAB operations to minimize conflicts with the Owner's operations.
- B. Partial Owner Occupancy: The Owner may occupy completed areas of the building before Substantial Completion. Cooperate with the Owner during TAB operations to minimize conflicts with the Owner's operations.



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- C. Non-Owner Occupancy: Complete balancing of building systems prior to Substantial Completion and owner occupancy.

**3.2 EXAMINATION**

- A. Examine Contract Documents to become familiar with project requirements and existing building record documents (if available) to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.
  - 1. Contract Documents are defined in the General and Supplementary Conditions of the Contract.
  - 2. Verify that balancing devices, such as test ports, gauge cocks, thermometer wells, flow-control devices, balancing valves and fittings are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.
- B. Examine approved submittal data of plumbing systems and equipment.
- C. Examine equipment performance data including pump curves. 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.
- D. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Specification Sections have been performed.
- E. Examine system and equipment installations to verify that indicated balancing devices, such as test ports, gauge cocks, thermometer wells, flow-control devices, balancing valves and fittings are properly installed, and their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.
- F. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.
- G. Examine open-piping-system pumps to ensure absence of entrained air in the suction piping.
- H. Examine equipment for installation and for properly operating safety interlocks and controls.
- I. Examine automatic temperature system components to verify the following:
  - 1. Valves, and other controlled devices operate by the intended controller.
  - 2. Valves are in the position indicated by the controller.
  - 3. Integrity of valves for free and full operation and for tightness of fully closed and fully open positions.



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- 4. Automatic modulating and shutoff valves, including 2-way valves and 3-way mixing and diverting valves, are properly connected.
- 5. Sensors are located to sense only the intended conditions.
- 6. Sequence of operation for control modes is according to the Contract Documents.
- 7. Controller set points are set at design values. Observe and record system reactions to changes in conditions. Record default set points if different from design values.
- J. Report deficiencies discovered before and during performance of TAB procedures.
- K. Beginning of work means acceptance of existing conditions.

**3.3 PREPARATION**

- A. Prepare a TAB plan that includes strategies and step-by-step procedures.
- B. Complete system readiness checks and prepare system readiness reports. Verify the following:
  - 1. Permanent electrical power wiring is complete.
  - 2. Systems are filled, clean, and free of air.
  - 3. Automatic temperature-control systems are operational.
  - 4. Isolating and balancing valves are open and control valves are operational.
- C. Hold a pre-balancing meeting at least one week prior to starting TAB work.
  - 1. Attendance is required by installers whose work will be tested, adjusted, or balanced.
- D. Provide instruments required for TAB operations. Make instruments available to Architect to facilitate spot checks during testing.

**3.4 GENERAL TESTING AND BALANCING PROCEDURES**

- A. Perform TAB procedures on each system according to the procedures contained in AABC national standards or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and this Section.
- B. Cut insulation for pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to the insulation Specifications for this Project.



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- C. Mark equipment settings with paint or other suitable, permanent identification material, including control positions, valve indicators and similar controls and devices, to show final settings.

**3.5 ADJUSTMENT TOLERANCES**

- A. Piping Systems: Adjust to within plus or minus 10 percent of Design.

**3.6 RECORDING AND ADJUSTING**

- A. Field Logs: Maintain written logs including:
  - 1. Running log of events and issues.
  - 2. Discrepancies, deficient or uncompleted work by others.
  - 3. Contract interpretation requests.
  - 4. Lists of completed tests.
- B. Ensure recorded data represents actual measured or observed conditions.
- C. Permanently mark settings of valves and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- D. Mark on drawings locations where other critical measurements were taken and cross reference location in final report.

**3.7 FUNDAMENTAL PROCEDURES FOR PIPING SYSTEMS**

- A. Prepare test reports with pertinent design data and number in sequence starting at pump to end of system. Check the sum of branch-circuit flows against approved pump flow rate. Correct variations that exceed plus or minus 10 percent.
- B. Prepare schematic diagrams of systems' "as-built" piping layouts.
- C. Prepare systems for TAB according to the following, in addition to the general preparation procedures specified above:
  - 1. Open manual valves for maximum flow.
  - 2. Check expansion tank liquid level, or air charge if bladder type.
  - 3. Check makeup-water-station pressure gauge for adequate pressure.
  - 4. Check flow-control valves for specified sequence of operation and set at design flow.
  - 5. Check pump-motor load. If motor is overloaded, throttle main flow-balancing device so motor nameplate rating is not exceeded.



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**3.8 FINAL REPORT**

- A. General: Computer printout in letter-quality font, on standard bond paper, in 3-ring binder, tabulated and divided into Sections by tested and balanced systems.
- B. Include a certification sheet in front of binder signed and sealed by the certified TAB engineer.
  - 1. Include a list of the instruments used for procedures, along with proof of calibration.
- C. Final Report Contents: In addition to the certified field report data, include the following:
  - 1. Pump curves.
  - 2. Field test reports prepared by system and equipment installers.
  - 3. Other information relative to equipment performance, but do not include approved Shop Drawings and Product Data.
- D. General Report Data: In addition to the form titles and entries, include the following data in the final report, as applicable:
  - 1. Title page.
  - 2. Name and address of TAB Agent.
  - 3. Project name.
  - 4. Project location.
  - 5. Architect's name and address.
  - 6. Engineer's name and address.
  - 7. Contractor's name and address.
  - 8. Report date.
  - 9. Signature of TAB Agent who certifies the report.
  - 10. Summary of contents, including the following:
    - a. Design versus final performance.
    - b. Notable characteristics of systems.
    - c. Description of system operation sequence if it varies from the Contract Documents.
  - 11. Nomenclature sheets for each item of equipment.



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TESTING, ADJUSTING, AND  
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12. Notes to explain why certain final data in the body of reports vary from design values.
- E. Pump Test Reports: For pumps, include the following data. Calculate impeller size by plotting the shutoff head on pump curves.
1. Unit Data: Include the following:
    - a. Unit identification.
    - b. Location.
    - c. Service.
    - d. Make and size.
    - e. Model and serial numbers.
    - f. Water flow rate in gpm (L/s).
    - g. Water pressure differential in feet of head or PSIG (kPa).
    - h. Required net positive suction head in feet of head or PSIG (kPa).
    - i. Pump rpm.
    - j. Impeller diameter in inches.
    - k. Motor make and frame size.
    - l. Motor horsepower and rpm.
    - m. Voltage at each connection.

**END OF SECTION**

**SECTION 22 07 00  
PLUMBING INSULATION**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Work Included:
  - 1. Type 1, Glass Wool Pipe Insulation
  - 2. Type 7, ADA Accessible Lavatory/Sink Insulation Kit
  - 3. Accessories
  - 4. Pipe Fitting Insulation Covers

**1.2 RELATED SECTIONS**

- A. Contents of Division 22, Plumbing and Division 01, General Requirements apply to this Section.

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.
- B. In addition, meet the following:
  - 1. Piping insulation products to contain less than 0.1 percent by weight PBDE in all insulating materials.

**1.4 SUBMITTALS**

- A. Submittals as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.
- B. In addition, provide:
  - 1. Installer qualifications.
  - 2. Product Data: Identify thermal conductivity, thickness, and jackets (both factory and field applied, if any) for each type of product indicated.
  - 3. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets with requirements indicated. Include dates of tests.
  - 4. Installer Certificates: Signed by the Contractor certifying that installers comply with requirements.
  - 5. Submit manufacturer's installation instructions.



## **SECTION 22 07 00 PLUMBING INSULATION**

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### **1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements apply to this Section.
- B. In addition, meet the following:
  - 1. Formaldehyde Free: Should be third-party certified with UL Environment Validation.
  - 2. Recycled Content: A minimum of 40 percent post-consumer recycled glass content certified and UL validated.
  - 3. Low Emitting Materials: For all thermal and acoustical applications of Glass Mineral Wool Insulation products, provide materials complying with the testing and products requirements of UL GREENGUARD Gold Certification.
  - 4. Installer to have minimum 5 years' experience in the business of installing insulation.

### **1.6 WARRANTY**

- A. Warranty of materials and workmanship as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

### **1.7 FIRE HAZARD CLASSIFICATION**

- A. Maximum fire hazard classification of the composite insulation construction as installed to be not more than a Flame Spread Index (FSI) of 25 and Smoke Developed Index (SDI) of 50 as tested by current edition of ASTM E84 (NFPA 255) method.
- B. Test pipe insulation in accordance with requirements of current edition of UL "Pipe and Equipment Coverings."

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Type 1, Glass Wool Pipe Insulation:
  - 1. Johns Manville
  - 2. Knauf
  - 3. Owens-Corning
  - 4. Or approved equivalent.
- B. Type 7, ADA Accessible Lavatory/Sink Insulation Kit:
  - 1. IPS/Truebro



2. McGuire/Pro-Wrap
  3. Plumberex/Pro-Extreme
  4. Brocar Trap Wrap
  5. Or approved equivalent.
- C. Accessories:
1. ITW Insulation Systems
  2. Or approved equivalent.
- D. Pipe Fitting Insulation Covers:
1. Zeston Johns Manville
  2. ITW Insulation Systems
  3. Or approved equivalent.

## **2.2 TYPE 1, GLASS WOOL PIPE INSULATION**

- A. Glass Fiber: ASTM C547 Type I and IV; rigid molded, noncombustible.
1. Thermal Conductivity Value: 0.27 BTU\*in/(hr\*sf°F) at 75 degrees F.
  2. Maximum Service Temperature: 850 degrees F to 1000 degrees F.
  3. Vapor Retarder Jacket: White Kraft paper reinforced with glass fiber and bonded to aluminum foil, with self-sealing longitudinal laps and butt strips or vapor barrier mastic.

## **2.3 TYPE 7, ADA ACCESSIBLE LAVATORY/SINK INSULATION KIT**

- A. P-traps, trap arms, tail pieces, hot water and cold water insulating guards meeting ASTM C1822. Molded closed cell insulation with vinyl cover and nylon fasteners, paintable. Provide accessories as required for complete installation covering all exposed waste piping, water piping, stops and supplies. Color white.

## **2.4 ACCESSORIES**

- A. Equipment Insulation Compounds: Provide adhesives, cement, sealers, mastics and protective finishes as recommended by insulation manufacturer for applications indicated.
- B. Provide staples, bands, wire, wire netting, tape corner angles, anchors, stud pins and metal covers as recommended by insulation manufacturer for applications indicated. Accessories, i.e., adhesives, mastics, cements and tape to have same flame and smoke component ratings as insulation materials with which they are used. Shipping cartons to bear a label indicating that flame and smoke ratings do not exceed those listed above. Provide permanent treatment of jackets or facings to impart flame and smoke safety.



## SECTION 22 07 00 PLUMBING INSULATION

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Provide non-water soluble treatments. Provide UV protection recommended by manufacturer for outdoor installation.

### 2.5 PIPE FITTING INSULATION COVERS

- A. PVC Plastic Fitting Covers: Schuller Zeston 2000, Knauf Proto Fitting or approved equivalent. One-piece molded type fitting covers and jacketing material, gloss white. Connections: Tacks; pressure sensitive color matching vinyl tape.

## PART 3 - EXECUTION

### 3.1 GENERAL INSTALLATION INFORMATION

- A. Verification of Conditions:
  - 1. Do not apply insulation until pressure testing and inspection of piping has been completed.
  - 2. Examine areas and conditions under which insulation will be installed. Do not proceed with work until unsatisfactory conditions have been corrected.
- B. Preparation: Clean and dry surfaces to be insulated.
- C. Installation:
  - 1. Insulation: Continuous through walls, floors, and partitions except where noted otherwise.
  - 2. Piping and Equipment:
    - a. Install insulation over clean, dry surfaces with adjoining sections firmly butted together and covering surfaces. Fill voids and holes. Seal raw edges. Install insulation in a manner such that insulation may be split, removed, and reinstalled with vapor barrier tape on strainer caps and unions. Do not install insulation until piping has been leak tested and has passed such tests. Do not insulate manholes, equipment manufacturer's nameplates, handholes, and ASME stamps. Provide beveled edge at such insulation interruptions. Repair voids or tears.
- D. Provide accessories as required. See Part 2 Article "Accessories" above.
- E. Protection and Replacement: Protect installed insulation during construction. Replace damaged insulation which cannot be repaired satisfactorily, including units with vapor barrier damage and moisture saturated units.
- F. Labeling and Marking: Provide labels, arrows and color coding on piping. Attach labels and flow direction arrows to jacketing per Section 22 05 53, Identification for Plumbing Piping and Equipment.
- G. Insulation Shields: Provide hangers and shields (18 gauge minimum) outside of insulation for cold piping (<60 degrees F). Hot water piping hangers may penetrate insulation to

contact pipe directly. Provide 18-inch long, noncompressible insulation section at insulation shields for lines 1-1/2-inches and larger (hot and cold piping).

H. Piping Surfaces to be Insulated:

Item to be Insulated	System Insulation Type	Pipe Size	Insulation Thickness
Hot Water Piping Above Grade (105F to 140F)	1	<1-inch =>1-inch	1-inch 1-1/2-inch
Hot Water Piping Above Grade (141F to 200F)	1	<1-1/2-inch =>1-1/2-inch	1-1/2-inch 2-inch
Cold Water Piping Above Grade	1	=<1-1/2-inch >1-1/2-inch	1/2-inch 1-inch
ADA Accessible Lavatory/Sink	7	All	As Listed
Condensate Drain Piping	1, 2	All	1/2-inch

**3.2 TYPE 1, GLASS WOOL PIPE INSULATION**

- A. See General Installation Requirements above.
- B. Install in accordance with manufacturer's instructions for below grade installation.
- C. Lap seal insulation with waterproof adhesive. Do not use staples or other methods of attachment which would penetrate vapor barrier. Apply fitting covers with seated tacks and vapor barrier tape.
- D. Apply insulation to pipe and seal with self-sealing lap. Use self-sealing butt strips to seal butt joints. Insulate fittings, valves and unions with single or multiple layers of insulation and cover to match pipe or use preformed PVC molded insulation covers.
- E. Above Grade Roof Drain/Overflow Drain Piping: Cover all roof drain piping and overflow drain piping with sectional pipe covering.

**3.3 TYPE 7, ADA ACCESSIBLE LAVATORY/SINK INSULATION KIT**

- A. See General Installation Requirements above.
- B. Install in accordance with manufacturer's instructions.
- C. Provide lavatory/sink insulation kit. Install on waste fittings, hot and cold water stops and supplies.



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**3.4 ACCESSORIES**

- A. See General Installation Requirements above.
- B. Install in accordance with manufacturer's instructions.
- C. Furnish and install accessories for all insulation types listed in this Section.

**3.5 PIPE FITTING INSULATION COVERS**

- A. See General Installation Requirements above.
- B. Install in accordance with manufacturer's instructions.

**END OF SECTION**

**SECTION 22 08 00  
COMMISSIONING OF PLUMBING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Work Included:
  - 1. See Division 01, General Requirements for overall objectives and comply with requirements.
  - 2. This section covers the Contractor's responsibilities for commissioning; installer responsible for installation of a particular system or equipment item to be commissioned is responsible for commissioning activities relating to that system or equipment item.
  - 3. Pre-Functional Checklist and Functional Test requirements specified in this Section are in addition to, not a substitute for, inspection or testing specified in other sections.

**1.2 RELATED SECTIONS**

- A. Contents of Division 22, Plumbing and Division 01, General Requirements apply to this section.

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.
- B. Meet requirements of ASHRAE Guideline 0, The Commissioning Process.

**1.4 SUBMITTALS**

- A. Submittals as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.
- B. In addition, provide Pressure Tests, Flushing Reports, and Startup Reports. Submit for approval of Commissioning Authority.

**1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

**1.6 WARRANTY**

- A. Warranty of materials and workmanship as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.
- B. In addition, provide:



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1. Commissioning, inspecting, and testing will not modify terms or time periods of mechanical equipment, systems, and controls warranties including related equipment and system, and adjacent work.
2. Control system warranty period starts from date of Commissioning Agent acceptance.

**1.7 COORDINATION**

- A. Reference Section 01 91 13, General Commissioning Requirements for requirements pertaining to coordination during the commissioning process.

**1.8 PURPOSE**

- A. Purpose of commissioning process is to provide Owner assurance that systems have been installed in prescribed manner and will operate within performance guidelines. Commissioning is intended to enhance quality of system startup and aid in orderly transfer of systems to beneficial use by Owner.
- B. Commissioning procedures and results will be observed by Commissioning Authority or Owner's staff. Contractor is expected to verify functional readiness of systems to be tested prior to performing the tests in presence of Owner's witness. A high rate of test failure will indicate that Contractor has not adequately verified readiness of systems.

**PART 2 - PRODUCTS**

**2.1 TEST EQUIPMENT**

- A. Provide standard testing equipment required to perform startup and initial checkout and required functional performance testing; unless otherwise noted such testing equipment will NOT become property of Owner.
- B. Specialized tools, test equipment, and instruments required to execute Start-up, checkout, and testing of equipment are to be of sufficient quality and accuracy to test and/or measure system performance within specified tolerances. A testing laboratory must have calibrated its test equipment within the previous 12 months. Calibration to be NIST traceable. Contractor must calibrate test equipment and instruments according to manufacturer's recommended intervals and whenever the test equipment is dropped or damaged. Calibration tags must be affixed to the test equipment or certificates readily available.
- C. Equipment-Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required in order to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost to Owner; such equipment, tools, and instruments are to become property of Owner.



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**PART 3 - EXECUTION**

**3.1 PREPARATION**

- A. Cooperate with Commissioning Authority in development of the Pre-Functional Checklists and Functional Test Procedures.
- B. As part of required submittals for contract, within three months of award of contract, submit for each piece of equipment and controls, manufacturer's startup and installation procedures as well as controls point-to-point and sequence checkout and provide in check list format.
- C. Furnish additional information requested by the Commissioning Authority.
- D. Prepare a preliminary schedule for plumbing pipe systems testing, flushing and cleaning, equipment start-up and testing, adjusting, and balancing start and completion for use by the Commissioning Authority; update schedule as appropriate.
- E. Notify Commissioning Authority when pipe system testing, flushing, cleaning, startup of each piece of equipment and testing, adjusting, and balancing will occur; when commissioning activities not yet performed or not yet scheduled will delay construction notify ahead of time and be proactive in seeing that Commissioning Authority has scheduling information needed to efficiently execute commissioning process.
- F. Put equipment and systems into operation and continue operation during each working day of testing, adjusting, and balancing and commissioning, as required.
- G. Provide temperature and pressure taps in accordance with Contract Documents.
- H. Provide a pressure/temperature plug at each water sensor which is an input point to control system.

**3.2 CONTRACTOR'S RESPONSIBILITIES**

- A. Perform commissioning tests at the direction of the Commissioning Authority.
- B. Participate in Plumbing systems, assemblies, equipment, and component maintenance orientation and inspection as directed by the Commissioning Authority.
- C. Provide information requested by the Commissioning Authority for final commissioning documentation.
- D. Include requirements for submittal data, operation and maintenance data, and training in each purchase order or sub-contract written.
- E. Prepare preliminary schedule for Plumbing system orientations and inspections, operation and maintenance manual submissions, training sessions, pipe and duct system testing, flushing and cleaning, equipment startup, testing and balancing and task completion for Owner. Distribute preliminary schedule to commissioning team members.
- F. Update schedule as required throughout the construction period.



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- G. During the startup and initial checkout process, execute the related portions of the Pre-Functional Checklists for commissioned equipment.
- H. Contractor to participate and complete checklists using the Commissioning Authority's web based commissioning software Facility Grid. A desktop, laptop, tablet, or iPad will be required.
- I. Assist the Commissioning Authority in verification and Functional Performance Tests.
- J. Gather operation and maintenance literature on equipment and assemble in binders as required by the Specifications. Submit to Commissioning Authority 45 days after substantial completion.
- K. Coordinate with the Commissioning Authority to provide 48 hour advance notice so that the witnessing of equipment and system startup and testing can begin.
- L. Notify the Commissioning Authority a minimum of one week in advance of the time for the start of the balancing work.
- M. Participate in, and schedule vendors and contractors to participate in the training sessions.
- N. Provide written notification to the CM/GC and Commissioning Authority that the following work has been completed in accordance with the Contract Documents, and that the equipment, systems, and sub-system are operating as required.
  - 1. Plumbing equipment including domestic water heaters, pumps, plumbing fixtures, and other equipment furnished under this Division.
  - 2. Gas piping, sanitary waste and vent piping, storm drainage piping, sump pumps and automatic sprinkler system.
- O. Provide training of the Owner's operating staff using expert qualified personnel, as specified.
- P. Reference Section 01 91 13, General Commissioning Requirements, for additional contractor responsibilities.

### **3.3 OWNER'S RESPONSIBILITIES**

- A. Reference Section 01 91 13, General Commissioning Requirements for Owner's responsibilities.

### **3.4 DESIGN PROFESSIONAL'S RESPONSIBILITIES**

- A. Reference Section 01 91 13, General Commissioning Requirements for the Architect, Mechanical, Electrical, and Plumbing Engineer's responsibilities.

### **3.5 COMMISSIONING AUTHORITY'S RESPONSIBILITIES**

- A. Reference Section 01 91 13, General Commissioning Requirements for the Commissioning Authority's responsibilities.





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### **3.6 TESTING PREPARATION**

- A. Certify, in writing, to the Commissioning Authority that plumbing instrumentation and control systems have been completed and calibrated, that they are operating according to the Contract Documents, and that pre-test setpoints have been recorded.
- B. Certify, in writing, that discrepancies discovered during the test and balance process have been resolved and that testing, adjusting, and balancing is completed.
- C. Set systems, subsystems, and equipment into operating mode to be tested (e.g. normal auto position, normal manual position, unoccupied mode, emergency power and alarm conditions).
- D. Inspect and verify the position of each device and interlock identified on checklists.
- E. Check safety cutouts, alarms, and interlocks with smoke control and life-safety systems during each mode operation.

### **3.7 TAB COORDINATION**

- A. TAB: Testing, adjusting, and balancing of Plumbing.
- B. Coordinate commissioning schedule with TAB schedule.
- C. Review the TAB plan to determine capabilities of the control system toward completing TAB.
- D. Provide necessary unique instruments and instruct TAB technicians in their use; such as handheld control system interface, etc.
- E. Have required Pre-Functional Checklists, calibrations, startup and component Functional Tests of the system completed and approved by Commissioning Authority prior to starting TAB.
- F. Provide a qualified control system technician to operate controls to assist TAB technicians or provide sufficient training for TAB technicians to operate system without assistance.

### **3.8 GENERAL TESTING REQUIREMENTS**

- A. Provide technicians, instrumentation, and tools to perform commissioning test at the direction of Commissioning Authority.
- B. Scope of Plumbing testing to include entire Plumbing installation. Testing to include measuring capacities and effectiveness of operational and control functions.
- C. Test operating modes, interlocks, control responses, and responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.



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- D. The Commissioning Authority along with the Plumbing contractor, balancing subcontractor to prepare detailed testing plans, procedures, and checklists for Plumbing systems, subsystems, and equipment.
- E. Tests will be performed using design conditions whenever applicable.
- F. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions as directed by the Commissioning Authority and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.
- G. The Commissioning Authority may direct that setpoints be altered when simulating conditions is not practical.
- H. The Commissioning Authority may direct that sensor values be altered with a signal generator when design or simulating conditions and altering setpoints are not practical.
- I. If tests cannot be completed because of a deficiency outside the scope of the Plumbing system, document the deficiency and report it to the Owner. After deficiencies are resolved, reschedule tests.

### 3.9 PLUMBING SYSTEMS, SUBSYSTEMS AND EQUIPMENT TESTING PROCEDURES

- A. Pipe system cleaning, flushing, hydrostatic tests, and chemical treatment: Test requirements are specified in Division 22, Plumbing Piping sections. Plumbing Contractor to prepare a pipe system cleaning, flushing, and hydrostatic testing plan. Provide cleaning, flushing, testing, and treating plan and final reports to the Commissioning Authority. Plan should include the following.
  - 1. Sequence of testing procedures for each section of pipe to be tested, identified by pipe zone or sector identifications marker. Markers to be keyed to Drawings for each pipe sector, showing the physical location of each designated pipe test section. Drawings keyed to pipe zones or sectors to be formatted to allow each section to be physically located and identified when referred to in pipe system cleaning, flushing, hydrostatic testing, and chemical treatment plan.
  - 2. Description of equipment for flushing operations.
  - 3. Minimum flushing velocity.
- B. Functional Performance Tests: Tests will be fully documented with test procedures, expected results for each procedure, and documented in either pass or fail. Tests are written by the Commissioning Authority and performed by the Contractor. The Commissioning Authority documents the results of the test.

### 3.10 DEFICIENCIES / NON-CONFORMANCE AND COST OF RETESTING

- A. The Commissioning Authority documents the results of the tests. Corrections of minor deficiencies identified are made during the tests at the discretion of the Commissioning Authority. The Commissioning Authority documents the testing results on the Functional Performance Testing document. Deficiencies or non-conformance issues are noted and



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reported to the GC and Owner via the Master Cx Issues/Resolutions Log. The Contractor will then correct deficiencies, notify the Commissioning Authority of the correction, and then schedule retesting of the issue with the GC and Commissioning Authority. For areas in dispute of the issue between the Commissioning Authority and Contractor to go directly to the A/E. A/E to provide direction of the design intent and expected result to clear up the dispute.

- B. If the Plumbing contractor fails to demonstrate proper sequence of operation in any of the second round of Functional Performance Tests, the Commissioning Authority's costs for witnessing further demonstration of that test procedure may be assigned to the Plumbing contractor by the Owner as a deduct to their contracted price. The Plumbing contractor will not be responsible for costs related to failure due to design or other factors beyond their control, though it is expected to call any design concerns (and other factors beyond their control that might cause failure) to the attention of the GC and Commissioning Authority.
- C. Reference Section 01 91 13, General Commissioning Requirements for additional contractor responsibilities

#### 3.11 OPERATION AND MAINTENANCE MANUALS

- A. See Division 01, General Requirements for additional requirements.
- B. Submit manuals related to items that were commissioned to Commissioning Authority for review; make changes recommended by Commissioning Authority.
- C. Commissioning Authority will add commissioning records to manuals after submission to Owner.

#### 3.12 DEMONSTRATION AND TRAINING

- A. See Division 01, General Requirements for additional requirements.
- B. Demonstrate operation and maintenance of Plumbing systems to Owner's personnel; if during any demonstration, system fails to perform in accordance with information included in Operations and Maintenance (O&M) manual, stop demonstration, repair or adjust, and repeat demonstration. Demonstrations may be combined with training sessions if appropriate.
- C. These demonstrations are in addition to, and not a substitute for, Pre-Functional Checklists and demonstrations to Commissioning Authority during Functional Testing.
- D. Training:
  - 1. Submit a written training plan to the Owner and Architect/Engineer for review and approval. Contractor's training plan to cover the following elements:
    - a. Equipment included in training.
      - 1) Intended audience.
      - 2) Location of training.



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- 3) Objectives.
  - b. Subjects covered.
  - c. Duration of training on each subject.
  - d. Instructor for each subject.
  - e. Methods (classroom lecture, video, Site walk-through, actual operational demonstrations, written hand outs, etc.).
  - f. Instructors and qualifications.
- 2. Contractor is to have the following training responsibilities:
  - a. Provide a training plan ten calendar days prior to the scheduled training, in accordance with Division 01, General Requirements.
  - b. Provide Owner personnel with comprehensive training in the understanding of the systems and the operation and maintenance of each major piece of commissioned mechanical equipment or system.
  - c. Training to start with classroom sessions, if necessary, followed by hands-on training on each piece of equipment, which will illustrate the various modes of operation, including start-up, shutdown, fire/smoke alarm, power failure, etc.
  - d. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.
  - e. The appropriate trade or manufacturer's representative will provide the instructions on each major piece of equipment. This representative may be the Start-up technician for the piece of equipment, the installing contractor, or the manufacturer's representative. Practical building operating expertise, as well as in-depth knowledge of modes of operation of the specific piece of equipment, is required. More than one party may be required to execute the training.
- E. Provide the services of manufacturer representatives to assist instructors where necessary.

**END OF SECTION**

**SECTION 22 10 00  
PLUMBING PIPING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Work Included:
  - 1. Sanitary, Drainage DWV Piping, Buried Within 5-feet of Building
  - 2. Sanitary, Drainage DWV Piping, Above Grade
  - 3. Water Piping, Buried Within 5-feet of Building
  - 4. Hot and Cold Domestic Water Above Grade
  - 5. Condensate Piping
  - 6. Primer Piping
  - 7. Flanges, Unions, and Couplings
  - 8. Piping Specialties
  - 9. Cleanouts

**1.2 RELATED SECTIONS**

- A. Contents of Division 22, Plumbing and Division 01, General Requirements apply to this Section.

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.
- B. In addition, meet the following:
  - 1. NSF 61, Annex G.
  - 2. Copper piping to conform to ASTM B88, B306 and B208 and the standards of Copper Development Association (CDA), and American Welding Society, (AWS).
  - 3. Cast Iron Piping to conform to standards of ASTM A-74, CISPI 301 and FM 1680.
  - 4. Manufacturer's Standards Society (MSS) for valving and support reference standard.
  - 5. American Water Works Association (AWWA) for Valving Assembly Standards.
  - 6. American Society of Sanitation Engineers (ASSE) for Valving Standards.



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7. American National Standards Institute (ANSI) for Piping Standards.
8. NFPA Standard 51B - "Fire Prevention in Use of Cutting and Welding Processes."

### **1.4 SUBMITTALS**

- A. Submittals as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

### **1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

### **1.6 WARRANTY**

- A. Warranty of materials and workmanship as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. See component manufacturers listed in individual articles below.
- B. American-USA
- C. Charlotte
- D. Elkhart
- E. Enfield
- F. Husky
- G. Ideal
- H. Mifab
- I. Mission
- J. Mueller
- K. Nibco
- L. Spears
- M. Tyler
- N. Zurn
- O. Or approved equivalent.



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**P. Cleanouts:**

1. J.R. Smith
2. Mifab
3. Sioux Chief
4. Wade
5. Watts
6. Zurn
7. Or approved equivalent.

**Q. Firestopping Penetrations in Fire Rated Wall Floor Assemblies:**

1. Hilti
2. Proset
3. Or approved equivalent.

**2.2 GENERAL**

- A. Provide pipe, tube, and fittings of the same type, fitting requirements, grade, class, and the size and weight indicated or required for each service, as indicated in other Division 22, Plumbing Specifications. Where type, grade, or class is not indicated, provide proper selection as determined by installer for installation requirements, and comply with governing regulations and industry standards.
- B. Manufactured materials delivered, new to the project site and stored in their original containers.
- C. Product Marking: Furnish each item with legible markings indicating name brand and manufacturer, manufacturing process, heat number and markings as required per ASTM and UL/FM Standards.

**2.3 SANITARY, DRAINAGE DWV PIPING, BURIED WITHIN 5-FEET OF BUILDING**

- A. Cast Iron Pipe: ASTM A888/CISPI 301 hubless.
  1. Fittings: Cast iron.
  2. Coupling Assembly:
    - a. Heavy Duty: ASTM C1540, Clamp-All Hi-Torq 125, Husky SD 4000, Mifab QXHUB, Mission HeavyWeight couplings.

**2.4 SANITARY, DRAINAGE DWV PIPING, ABOVE GRADE**

- A. Cast Iron Pipe: ASTM A888/CISPI 301 hubless.



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1. Fittings: Cast iron.
2. Coupling Assembly:
  - a. Standard Duty: ASTM C1277 or CISPI 310.

### **2.5 WATER PIPING, BURIED WITHIN 5-FEET OF BUILDING**

- A. Copper Pipe: ASTM B88, hard drawn, Type K (A).
  1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.
  2. Joints: Brazed - BCuP2.

### **2.6 HOT AND COLD DOMESTIC WATER ABOVE GRADE**

- A. Copper Tube: 2-1/2-inches and smaller. ASTM B88 (ASTM B88M), Type L (B), Drawn.
  1. Fittings: ASME B16.18 copper.
  2. Joints: ASTM B32, alloy Sn95 solder.

### **2.7 CONDENSATE PIPING**

- A. Copper Tube: ASTM B 88 (ASTM B898M), Type K (A), L (B), or M (C).
  1. Fittings: ASME B16.29, wrought copper.
  2. Joints: ASTM B32, alloy Sn50 solder.

### **2.8 PRIMER PIPING**

- A. Below Ground: Type L soft annealed copper tubing with wrought sweat fittings and brazed joints.

### **2.9 FLANGES, UNIONS, AND COUPLINGS**

- A. Unions for Pipe Sizes 3-Inches and Under:
  1. Ferrous Pipe: Class 150 malleable iron threaded unions.
  2. Copper Tube and Pipe: Class 150 bronze unions with soldered joints.
- B. Flanges for Pipe Size Over 1-Inch:
  1. Ferrous Pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
  2. Copper Tube and Pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.



- C. Dielectric Connections: Provide dielectric waterway or brass nipple fitting with threaded ends. Dielectric unions are not allowed.

**2.10 PIPING SPECIALTIES**

A. Pipe Escutcheons:

1. Provide pipe escutcheons as specified with inside diameter closely fitting pipe outside diameter, or outside of pipe insulation where pipe is insulated. Select outside diameter of escutcheon to completely cover pipe penetration hole in floors, walls, or ceilings; and pipe sleeve extension, if any. Furnish pipe escutcheons with nickel or chrome finish for occupied areas, prime zinc base paint finish for unoccupied areas.
2. Pipe Escutcheons for Moist Areas: For waterproof floors, and areas where water and condensation can be expected to accumulate, provide stainless steel, cast brass or sheet brass escutcheons, solid or split hinged.
3. Pipe Escutcheons for Dry Areas: Provide stainless steel escutcheons, solid or split hinged.

B. Low Pressure Y-Type Pipeline Strainers:

1. Provide strainers full line size of connecting piping, with ends matching piping system materials. Select strainers for 125 percent of the working pressure of piping system with Type 304 stainless steel screens made with 1/16-inch perforations on 4-inch and smaller strainers, and 1/8-inch perforations on 6-inch and larger strainers.
2. Threaded Ends, 2-inch and Smaller: Cast-iron body, screwed screen retainer with centered blowdown fitted with plug.
3. Flanged Ends, 2-1/2-inch and Larger: Cast-iron body, bolted screen retainer with off-center blowdown fitted with hose bibb.

C. Air Vent with Valves:

1. Install automatic air vents in all closed and open-loop water systems at high points and at any other point necessary to free system of air. Provide shut-off valve in riser to each automatic vent valve to facilitate servicing. Manual type vent may be used in lieu of automatic type, where specifically shown on the Drawings.
2. Manufacturer: Hoffman #79.

D. Dielectric Waterways:

1. Provide standard products recommended by manufacturers in service indicated, which effectively isolate ferrous from non-ferrous piping (eliminating electrical conductance) to prevent galvanic action and stop corrosion.
2. Provide dielectric waterways or brass nipple fitting for transitions between dissimilar metal piping.



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### E. Unions:

1. Unions to comply with the following schedule:
  - a. Soldered Copper or Brass Pipe, 2-inch and smaller: 150 PSI cast bronzed or copper, ground joint, non-ferrous seat with soldered ends.
  - b. Screwed Copper or Brass Pipe, 2-inch and smaller: 150 PSI cast brass, ground joint, brass to brass seat, threaded ends.
  - c. Manufacturer: EPCO, Mueller, Stanley G. Flagg, Watts, or approved equivalent.

### 2.11 CLEANOUTS

- A. Locate cleanouts as shown on Drawings and as required by local code. Cleanouts same size as pipe except that greater than 4-inches will not be required. Plastic components not allowed, except unless specifically noted.
- B. Types:
  1. Tile Floor Cleanouts: J. R. Smith 4020 with round heavy-duty nickel bronze top, taper thread, ABS plug and standard screws.
  2. Carpeted Floor Cleanout: J. R. Smith 4020-X with carpet clamping frame, round heavy-duty nickel bronze top, taper thread, ABS plug, carpet clamping device and standard screws.
  3. Concrete Floor Cleanout (General): J. R. Smith 4020 with round heavy-duty nickel bronze top, taper thread and ABS plug with standard screws.
  4. Wall Cleanout: J. R. Smith 4472-U, countersunk bronze taper thread plug, stainless steel shallow cover and vandalproof screws.

## PART 3 - EXECUTION

### 3.1 GENERAL INSTALLATION REQUIREMENTS

- A. Underground Piping Systems:
  1. Examination: Verify that excavations are to required grade, dry, and not over-excavated.
  2. Perform necessary excavation and backfill required for installation of plumbing work. Repair piping or other work at no expense to Owner.
  3. Water: Keep excavations free of standing water. Re-excavate and fill back excavations damaged or softened by water or frost to original level with sand, crushed rock or other approved material at no expense to Owner.
  4. Tests: During progress of work for compacted fill, Owner reserves right to request compaction tests made under direction of testing laboratory.



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5. Trench Excavation: Excavate trenches to necessary depth and width, removing rocks, unstable soil (muck, peat), roots and stumps. Excavation material is classified as "base fill" and "native." Base fill excavation material consisting of placed crushed rock may be used as backfill above "Pipe Zone." Remove and dispose off site native excavation material. Adequate width of trench for proper installation of piping or conduit.
6. Support Foundations:
- a. Foundations: Excavate trenches located in unstable ground areas below elevation required for installation of piping to depth which is determined by Architect as appropriate for conditions encountered. Place and compact approved foundation material in excavation up to "Bedding Zone." Dewatering, placement, compaction and disposal of excavated materials to conform to requirements contained in other Specification Sections or Drawings.
  - b. Over-Excavations: Where trench excavation exceeds required depths, provide, place and compact suitable bedding material to proper grade or elevation at no additional cost to Owner.
  - c. Foundation Material: Where native material has been removed, place and compact necessary foundation material to form base for replacement of required thickness of bedding material.

	Class A		Class B	
Material Passing	Min.	Max.	Min.	Max.
3/4-inch Square Opening	27	47	0	1

- d. Bedding Material: Full bed piping on sand, pea gravel, or 3/4-inch minus crushed rock. Place minimum 4-inch deep layer of sand, pea gravel, or crushed rock on leveled trench bottom for this purpose. Remove bedding to necessary depth for piping bells and couplings to maintain contact of pipe on bedding for its entire length. Provide additional bedding in excessively wet, unstable, or solid rock trench bottom conditions as required to provide firm foundation.
7. Backfilling:
- a. Following installation and successful completion of required tests, backfill piping in lifts.
    - 1) In "Pipe Zone" place backfill material and compact in lifts not to exceed 6-inches in depth to height of 12-inches above top of pipe. Place backfill material to obtain contact with entire periphery of pipe, without disturbing or displacing pipe.
    - 2) Place and compact backfill above "Pipe Zone" in layers not to exceed 12-inches in depth.

- b. Backfill Material:
  - 1) Backfill Material in "Pipe Zone": 3/4-inch minus crushed rock, sand or pea gravel.
  - 2) Crushed rock, fill sand or other backfill material approved elsewhere in Specifications may be used above "Pipe Zone."
- 8. Compaction of Trench Backfill:
  - a. Where compaction of trench backfill material is required, use one of following methods or combination thereof:
    - 1) Mechanical tamper,
    - 2) Vibratory compactor, or
    - 3) Other approved methods appropriate to conditions encountered.
  - b. Architect to have right to change methods and limits to better accommodate field conditions. Compaction sufficient to attain 95 percent of maximum density at optimum moisture content unless noted otherwise on Drawings or elsewhere in Specifications. Water "puddling" or "washing" is prohibited.
- B. General Installation:
  - 1. Work performed by experienced journeyman plumbers. No exceptions.
  - 2. Provide access panels for concealed valves, shock arrestors, trap primers and the like.
  - 3. Install pipes and pipe fittings in accordance with recognized industry practices and manufacturer's recommendations.
  - 4. Align piping accurately at connections, within 3/32-inch misalignment tolerance. Comply with ANSI B31 Code for Pressure Piping.
  - 5. Locate piping runs, as indicated, vertically and horizontally (pitched to drain) and avoid diagonal runs wherever possible. Orient horizontal runs parallel with walls and column lines. Locate runs as shown or described by diagrams, details, and notations or, if not otherwise indicated, run piping in shortest route which does not obstruct space or block access for servicing building and its equipment. Hold piping close to walls, overhead construction, and other structural and permanent-enclosure elements of building. Limit clearance to 1/2-inch where furring is shown for enclosure or concealment of piping, but allow for insulation thickness, if any. Where possible, locate insulated piping for 1-inch clearance outside insulation. Whenever possible in finished and occupied spaces, conceal piping from view by locating it in column enclosures, hollow wall construction or above suspended ceilings. Do not encase horizontal runs in solid partitions, except as indicated.

- a. Do not run piping through transformer vaults, telephone, elevator, electrical or electronic equipment spaces or enclosures unless indicated on Drawings.
- b. Concealed Piping Above Suspended Ceiling: Plan and coordinate to avoid interferences; install to maintain suspended ceiling heights shown on Architectural Drawings. Allow sufficient space above removable ceiling panels for panel removal. Locate piping so that valves are visible and accessible within 24-inches horizontally and vertically from point of access to the ceiling space. Provide plenum rated materials for ceiling spaces which are being used as plenums.
- c. Exposed Work: Run pipes parallel to the closest wall unless otherwise shown on Drawings; maintain maximum headroom; avoid light fixtures.
- d. Insulation Space Allowance: In piping work, allow space for pipe insulation and jackets. If interferences occur, move the piping to accommodate insulation thickness specified.
- e. Pipe Lengths: Do not use short lengths or nipples at locations where a full length of pipe will fit.
- f. Alignment Prior to Supporting and Anchoring: Place piping in proper alignment and position prior to connection to anchors, expansion loops, and equipment. Furnish jacking devices, temporary steel structural members, and assembled structures as necessary. Remove temporary equipment and structures supplied by contractor at completion; such items to remain Contractor property.
- g. Valve and Equipment Connections: Piping not to place undue stress on flanged valves and equipment connections. Install mating flange faces true and parallel to each other and not requiring springing of piping for assembly. Pipe hangers and supports to carry the full weight of the pipe and fluid.
- h. Piping Leaks: Correct immediately; use new materials; leak-sealing compounds or peening not permitted.
- i. Pressure Ratings of Fittings, Valves, and Devices in Piping Systems: Pressure rating to be equal to, or greater than, the maximum working pressure of the system.
- j. Equipment Vents and Drains: Provide for coils and vessels which contain water. Provide isolation valves and outlet valves at piping high and low points to permit venting and draining of the vessel without venting and draining connected piping. Provide hose connections and caps on drain lines.
- k. Escutcheon Plates: Where exposed insulated and uninsulated piping passes through walls, floors or ceilings; provide spring clip type. Provide plates on both sides of wall or floor.

C. Testing:



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1. General:
    - a. Provide temporary equipment for testing, including pumps, compressors, tanks, and gauges, as required. Test piping systems before insulation (if any) is installed and remove or disengage control devices before testing. Where necessary, test sections of each piping system independently, but do not use piping valves to isolate sections where test pressures exceed local valve operating pressure rating. Fill each section with water, compressed air, or nitrogen and pressurize for the indicated pressure and time.
    - b. Notify Architect and local Plumbing Inspector 2 days before tests.
    - c. Drainage, Waste and Vent Piping: Test in accordance with governing plumbing code or as follows: Test drainage and venting systems, with necessary openings plugged, to permit system to be filled with water and subjected to water pressure of minimum of 5 PSI head. System to hold water without water level drop greater than 1/2 pipe diameter of largest nominal pipe size within 24-hour period. Test system in sections if minimum head cannot be maintained in each section. 5 PSI head to be minimum pressure at highest joint.
    - d. Water Piping: Eliminate air from system. Fill and test at 125 PSIG or minimum 1-1/2 times static pressure at connection to serving utility main for period of two hours with no loss in pressure.
    - e. Send test results to Architect for review and approval and include in Operation and Maintenance Manual.
  2. Testing of Pressurized Systems:
    - a. Test each pressurized piping system at 150 percent of operating pressure indicated, but not less than 125 PSIG test pressure.
    - b. Observe each test section for leakage at end of test period. Test fails if leakage is observed or if pressure drop exceeds 2 percent of test pressure.
  3. Test hot and cold domestic water piping systems upon completion of rough-in and before connection to fixtures at hydrostatic pressure of 125 PSIG.
- D. Corrosive Soil Conditions:
1. Wrap steel, iron, copper or other metal piping materials/fittings with Protecto Wrap 200, 30 mils or greater. Maintain a 1/2-inch overlap and install per manufacturer's recommendations.
  2. Provide epoxy coated cast iron pipe and fittings for drainage systems.
  3. Obtain and review project soils report for verification of requirements concerning corrosive soils.

- E. Protection:
  - 1. Keep pipe openings closed by means of plugs or caps to prevent entrance of foreign matter. Protect piping, ductwork, fixtures, equipment and apparatus against dirty water, chemical or mechanical damage both before and after installation. Restore to its original condition or replace fixtures, equipment or apparatus damaged prior to final acceptance of work.
- F. Firestopping Penetrations in Fire-Rated Wall/Floor Assemblies:
  - 1. Provide proper sizing when providing sleeves or core-drilled holes to accommodate penetration. Firestop voids between sleeve or core-drilled hole and pipe passing through to meet requirements of ASTM E814.
- G. Cut piping squarely, free of rough edges and reamed to full bore. Insert piping fully into fittings.
- H. Provide joints of type indicated in each piping system.
- I. Thread pipe in accordance with ANSI/ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded ends to remove burrs and restore full inside diameter. Remove excess cutting oil from piping prior to assembly. Apply pipe joint compound, or pipe joint tape (Teflon) where recommended by pipe/fitting manufacturer, on male threads at each joint and tighten joint to leave not more than 3 threads exposed.
- J. Sleeves:
  - 1. Pipe Sleeves:
    - a. Layout work in advance of pouring concrete, furnish, and set sleeves necessary to complete work.
    - b. Floor Sleeves: Provide sleeves on pipes passing through concrete or masonry construction. Extend sleeve 1-inch above finished floor. Caulk pipes passing through floor with non-shrinking grout or approved caulking compound (except DWV Piping penetrating a concrete slab set on finish grade), provide modular link sealing system for concrete/slab penetrations which are below grade. Caulk/seal piping passing through fire rated building assembly with UL rated assemblies. Provide fire-rated assemblies per local AHJ requirements
    - c. Wall Sleeves: Provide sleeves on pipes passing through concrete or masonry construction. Provide sleeve flush with finished face of wall. Caulk pipes passing through walls with non-shrinking caulking compound. Provide modular link sealing system for concrete penetrations which are below grade. Caulk/seal piping passing through fire-rated assemblies per local AHJ requirements.
    - d. Beam Sleeves: Coordinate with trades for locations of pipe sleeves in reinforced concrete and steel beams. Indicate penetrations on structural shop drawings. See Drawings and Specifications for specific sleeve location limitations. Plumbing Drawings are diagrammatic. Offset piping as required to meet these limitations. Pipe sleeve locations must be

indicated on reinforced concrete and steel beam shop drawings. Field cutting of beams not allowed without written approval of structural engineer. No extra costs allowed for failure to coordinate beam penetrations prior to reinforced concrete and steel beam shop drawing submittal.

2. Installation of metallic or plastic piping penetrations through non fire-rated walls and partitions and through smoke-rated walls and partitions:
  - a. Install fabricated pipe sleeve.
  - b. After installation of sleeve and piping, tightly pack entire annular void between piping or piping insulation and sleeve identification.
  - c. Seal each end airtight with a resilient nonhardening seal per code.
3. Piping penetrations through fire-rated (1 to 3 hour) assemblies:
  - a. Select and install pre-engineered pipe penetration system in accordance with UL listing and manufacturer's recommendation.
  - b. Provide proper sizing when providing sleeves or core-drilled holes to accommodate penetration. Firestop voids between sleeve or core-drilled hole and pipe passing through to meet requirements of ASTM E84.

### **3.2 SANITARY, DRAINAGE DWV PIPING, BURIED WITHIN 5-FEET OF BUILDING**

- A. Excavation and Backfill:
  1. See General Installation Requirements above.
- B. Drainage, Waste and Vent Piping: Test in accordance with governing plumbing code or as follows: Test drainage and venting systems, with necessary openings plugged, to permit system to be filled with water and subjected to water pressure of minimum of 5 PSI head. System to hold water without water level drop greater than 1/2 pipe diameter of largest nominal pipe size within 24-hour period. Test system in sections if minimum head cannot be maintained in each section. 5 PSI head to be minimum pressure at highest joint.
- C. Corrosive Soil Conditions:
  1. Wrap steel, iron, copper or other metal piping materials/fittings with Protecto Wrap 200, 30 mils or greater. Maintain a 1/2-inch overlap and install per manufacturer's requirements.
  2. Provide epoxy coated cast iron pipe and fittings for drainage systems.
- D. Cast-Iron Joints: Comply with coupling manufacturer's Cast Iron Soil Pipe Institute Standards and installation instructions.
- E. Sanitary Drainage:
  1. Grade piping at a uniform pitch of 2 percent unless otherwise noted on Drawings.



2. Drains:

- a. Install drains to suit finished floor. Install drains and components per manufacturer's instructions. Slope flooring to floor drain or sink a minimum of 1/2-inch below finished floor elevation.
- b. Install P-traps for hub drains, floor drains and floor sinks. P-traps to be of the same materials as soil and waste piping. Provide trap primer assembly for each drain or floor sink.

- F. Epoxy Coated Cast Iron Pipe and Fittings: Coat the piping terminus of any cut piping with an applied epoxy per manufacturer's instructions. Denso Protal 7200 fast-cure epoxy repair coating.

**3.3 SANITARY, DRAINAGE DWV PIPING, ABOVE GRADE**

- A. Drainage, Waste and Vent Piping: Test in accordance with governing plumbing code or as follows: Test drainage and venting systems, with necessary openings plugged, to permit system to be filled with water and subjected to water pressure of minimum of 5 PSI head. System to hold water without water level drop greater than 1/2 pipe diameter of largest nominal pipe size within 24-hour period. Test system in sections if minimum head cannot be maintained in each section. 5 PSI head to be minimum pressure at highest joint.
- B. Firestopping Penetrations in Fire-Rated Wall/Floor Assemblies:
  - 1. Provide proper sizing when providing sleeves or core-drilled holes to accommodate penetration. Firestop voids between sleeve or core-drilled hole and pipe passing through to meet requirements of ASTM E814.
- C. Solder copper tube and fitting joints with lead free nickel/silver bearing solder meeting ASTM Std. B-32, in accordance with IAPMO Is 3-93, ASTM B-828 and Copper Development Association recommended procedures. Clean joints by other than chemical means prior to assembly. "Shock" cooling is prohibited. Fluxes to be water soluble for copper and brass potable water applications, and meeting CDA standard test method 1.0 and ASTM B813-91. Apply solder until a full fillet is present around the joint. Do not apply solder and flux in such excessive quantities as to run down interior of pipe. Lead solder or corrosion flux not to be present at the jobsite.
- D. Cast-Iron Joints: Comply with coupling manufacturer's Cast Iron Soil Pipe Institute Standards and installation instructions.
- E. Sanitary:
  - 1. Grade piping at a uniform pitch of 2 percent unless otherwise noted on Drawings.
  - 2. Indirect Waste or Drain Piping: Extend piping to discharge as shown on Drawings. Maintain minimum air gap. Provide traps on indirect waste or drain piping exceeding 60-inches.
  - 3. Fixture Carriers: Concealed fixture carriers for wall hung plumbing fixtures are specified in Section 22 40 00, Plumbing Fixtures.



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4. Drains:
  - a. Install drains to suit finished floor or roof surface. Install drains and components per manufacturer's instructions. Slope flooring to floor drain or sink a minimum of 1/2-inch below finished floor elevation.
  - b. Install P-traps for hub drains, floor drains and floor sinks. P-traps to be of the same materials as soil and waste piping. Provide trap primer assembly for each drain or floor sink.
5. Wall Access Panel: Secure to wall framing and install so that flange forms a close fitting joint with the finished wall surface.
6. Insulate horizontal branch lines from floor sinks, receptors and drains receiving cold discharge from equipment and appliances.

### **3.4 WATER PIPING, BURIED WITHIN 5-FEET OF BUILDING**

- A. Excavation and Backfill:
  1. See General Installation Requirements above.
- B. Water Piping: Eliminate air from system. Fill and test at 125 PSIG or minimum 1-1/2 times static pressure at connection to serving utility main for period of two hours with no loss in pressure.
- C. Domestic Water:
  1. "Piping" to include pipes, fittings, nipples, valves and accessories connected thereto.
  2. Run piping generally parallel to the axis of the building, arranged to conform to the building requirements and to suit the necessities of clearance for other mechanical ducts, flues, conduits and work of other trades, and as close to ceiling or other construction as practical, free of unnecessary traps or bends.
  3. Grade water supply piping for complete drainage of the system. Install hose bibbs at low points.
  4. Use unions for piping connections to equipment.
  5. Provide sufficient elbows, swings and offsets to permit free expansion and contraction.
  6. Use reducers or increasers. Use no bushings.
  7. Ream or file each pipe to remove burrs. Inspect each length of pipe and each fitting for workmanship and clear passageways.
  8. Cover, cap or otherwise protect open ends of piping during construction to prevent damage to threads or flanges and prevent entry of foreign matter. Disinfect and sterilize water supply piping as specified. Furnish written report on final water quality results.



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9. Install exposed connections to equipment with special care, showing no tool marks or threads at fittings and piping. No bowed or bent piping permitted.
  10. Make ferrous to non-ferrous connections with dielectric fittings.
  11. Use extra heavy pipe for nipples, where unthreaded portion is less than 1-1/2-inches. Use no close nipples. Use only shoulder-type nipples.
  12. Through-Wall Pipes: Type 'L' copper tubing for through-wall pipes which connect to exposed stops at wall surface. Anchor the pipes in the wall; attach pipe with U-bolts to steel back-up plates or steel angles anchored in the wall. Provide wrought copper elbow which securely anchors ends in wall at through-wall pipes.
  13. Provide drain valves at base of risers and at low points on the system.
  14. Backflow Preventers: Pipe relief to nearest drain. Slope at 2 percent.
- D. Sterilization of Domestic Water System:
1. General: Upon completion of tests and necessary replacements, thoroughly flush and disinfect domestic water piping.
  2. Method: After thoroughly flushing system with water to remove sediment, fill system with a solution containing 50 parts per million of chlorine for not less than 24 hours or 200 parts per million of chlorine for not less than 3 hours. After retention, drain, reflush and return system to service.
  3. Certification: Provide copy of domestic water chlorination certificate in each operations and maintenance manual.
  4. Provide water line disinfections performed by a licensed contractor with training in potable water line disinfections.
- E. Buried Pre-Insulated Pipe Installation:
1. Installation and Testing: Install and test products in accordance with manufacturer's installation instructions.
  2. Manufacturer's installation instructions are to describe the following:
    - a. Storage and handling of pipes.
    - b. Trench preparation.
    - c. Installing pipe.
    - d. Installing accessories.
    - e. Installing fittings.
    - f. Building penetrations.
    - g. Field insulation kits.

h. Testing.

**3.5 HOT AND COLD DOMESTIC WATER ABOVE GRADE**

- A. Water Piping: Eliminate air from system. Fill and test at 125 PSIG or minimum 1-1/2 times static pressure at connection to serving utility main for period of two hours with no loss in pressure.
- B. Testing of Pressurized Systems:
  - 1. Test each pressurized piping system at 150 percent of operating pressure indicated, but not less than 125 PSIG test pressure.
  - 2. Observe each test section for leakage at end of test period. Test fails if leakage is observed or if pressure drop exceeds 2 percent of test pressure.
- C. Test hot and cold domestic water piping systems upon completion of rough-in and before connection to fixtures at hydrostatic pressure of 125 PSIG.
- D. Firestopping Penetrations in Fire-Rated Wall/Floor Assemblies:
  - 1. Provide proper sizing when providing sleeves or core-drilled holes to accommodate penetration. Firestop voids between sleeve or core-drilled hole and pipe passing through to meet requirements of ASTM E814.
- E. Solder copper tube and fitting joints with lead free nickel/silver bearing solder meeting ASTM Std. B-32, in accordance with IAPMO Is 3-93, ASTM B-828 and Copper Development Association recommended procedures. Clean joints by other than chemical means prior to assembly. "Shock" cooling is prohibited. Fluxes to be water soluble for copper and brass potable water applications, and meeting CDA standard test method 1.0 and ASTM B813-91. Apply solder until a full fillet is present around the joint. Do not apply solder and flux in such excessive quantities as to run down interior of pipe. Lead solder or corrosion flux not to be present at the jobsite.
- F. Braze copper tube and fitting socket with BCuP series filler metal without flux. Use listed brazing flux for joining of copper tube to brass or bronze fittings, meeting AWS FB3A or FB3C. "Shock" cooling is prohibited. A continuous fillet is to be visible around the completed joint. After cooling, thoroughly remove flux residue with warm water and a brush prior to testing. Do not use BCuP filler on copper alloys containing over 10 percent nickel. Cap or plug piping during construction to prevent entry of foreign material.
- G. Domestic Water:
  - 1. "Piping" to include pipes, fittings, nipples, valves and accessories connected thereto.
  - 2. Run piping generally parallel to the axis of the building, arranged to conform to the building requirements and to suit the necessities of clearance for other mechanical ducts, flues, conduits and work of other trades, and as close to ceiling or other construction as practical, free of unnecessary traps or bends.
  - 3. Grade water supply piping for complete drainage of the system. Install hose bibbs at low points.

4. Use unions for piping connections to equipment.
5. Provide sufficient elbows, swings and offsets to permit free expansion and contraction.
6. Use reducers or increasers. Use no bushings.
7. Ream or file each pipe to remove burrs. Inspect each length of pipe and each fitting for workmanship and clear passageways.
8. Cover, cap or otherwise protect open ends of piping during construction to prevent damage to threads or flanges and prevent entry of foreign matter. Disinfect and sterilize water supply piping as specified. Furnish written report on final water quality results.
9. Install exposed connections to equipment with special care, showing no tool marks or threads at fittings and piping. No bowed or bent piping permitted.
10. Make ferrous to non-ferrous connections with dielectric fittings.
11. Use extra heavy pipe for nipples, where unthreaded portion is less than 1-1/2-inches. Use no close nipples. Use only shoulder-type nipples.
12. Through-Wall Pipes: Type 'L' copper tubing for through-wall pipes which connect to exposed stops at wall surface. Anchor the pipes in the wall; attach pipe with U-bolts to steel back-up plates or steel angles anchored in the wall. Provide wrought copper elbow which securely anchors ends in wall at through-wall pipes.
13. Provide drain valves at base of risers and at low points on the system.
14. Backflow Preventers: Pipe relief to nearest drain. Slope at 2 percent.

**H. Sterilization of Domestic Water System:**

1. General: Upon completion of tests and necessary replacements, thoroughly flush and disinfect domestic water piping.
2. Method: After thoroughly flushing system with water to remove sediment, fill system with a solution containing 50 parts per million of chlorine for not less than 24 hours or 200 parts per million of chlorine for not less than 3 hours. After retention, drain, reflush and return system to service.
3. Certification: Provide copy of domestic water chlorination certificate in each operations and maintenance manual.
4. Provide water line disinfections performed by a licensed contractor with training in potable water line disinfections.

**3.6 CONDENSATE PIPING**

**A. Firestopping Penetrations in Fire-Rated Wall/Floor Assemblies:**

1. Provide proper sizing when providing sleeves or core-drilled holes to accommodate penetration. Firestop voids between sleeve or core-drilled hole and pipe passing through to meet requirements of ASTM E814.

### **3.7 PRIMER PIPING**

- A. Excavation and Backfill:
  1. See General Installation Requirements above.
- B. Testing:
  1. See General Installation Requirements above.

### **3.8 FLANGES, UNIONS, AND COUPLINGS**

- A. Flanges:
  1. Provide flanges at steel or copper piping, valves and equipment, sizes 2-1/2-inches or larger, unless specified otherwise; weld neck or slip-on pattern.
  2. Bolts: Provide studs (both ends threaded) with hexagon nuts where necessary to facilitate removal of valves or disassembly of flanged systems.
  3. Dielectric Flanged Insulation: Provide on dissimilar metal flanged piping connections.

### **3.9 PIPING SPECIALTIES**

- A. Excavation and Backfill:
  1. See General Installation Requirements above.
- B. Drainage, Waste, and Vent Piping: Test in accordance with governing plumbing code or as follows: Test drainage and venting systems, with necessary openings plugged, to permit system to be filled with water and subjected to water pressure of minimum of 5 PSI head. System to hold water without water level drop greater than 1/2 pipe diameter of largest nominal pipe size within 24-hour period. Test system in sections if minimum head cannot be maintained in each section. 5 PSI head to be minimum pressure at highest joint.
- C. Corrosive Soil Conditions:
  1. Wrap steel, iron, copper or other metal piping materials/fittings with Protecto Wrap 200, 30 mils or greater. Maintain a 1/2-inch overlap and install per manufacturer's requirements.
  2. Provide epoxy coated cast iron pipe and fittings for drainage systems.
- D. Cast-Iron Joints: Comply with coupling manufacturer's Cast Iron Soil Pipe Institute Standards and installation instructions.



**SECTION 22 10 00  
PLUMBING PIPING**

**DIVISION 22**

**3.10 CLEANOUTS**

- A. Install in aboveground piping and building drain piping as indicated, as required by code; at each change in direction of piping greater than 135 degrees; at minimum intervals of 100-feet; and at base of each vertical soil or waste stack. Install floor and wall cleanout covers for concealed piping. Select type to match adjacent building finish. Provide shop drawings to Architect to coordinate locations and types of cleanouts with Architect prior to installation.

**END OF SECTION**

**SECTION 22 30 00  
PLUMBING EQUIPMENT**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Work Included:
  - 1. Commercial Light Duty Electric Storage Type Water Heaters
  - 2. Domestic Expansion Tanks ASME
  - 3. Domestic Circulation Pumps - Close-Coupled, In-Line
  - 4. Garbage Disposal

**1.2 RELATED SECTIONS**

- A. Contents of Division 22, Plumbing and Division 01, General Requirements apply to this Section.

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

**1.4 SUBMITTALS**

- A. Submittals as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.
- B. In addition, provide:
  - 1. Seismic anchor details and calculations signed and stamped by licensed California structural engineer with equipment data.

**1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.
- B. In addition, meet the following:
  - 1. NSF 61, Annex G compliant.
  - 2. ISO 9001 Certified.
  - 3. IAPMO Low Lead Certification.
- C. Products approved for installation by state authorizing agency, no exceptions.





**SECTION 22 30 00  
PLUMBING EQUIPMENT**

**DIVISION 22**

**1.6 WARRANTY**

- A. Warranty of materials and workmanship as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Commercial Light Duty Electric Storage Type Water Heaters:

1. Hubbell Series E
2. A.O. Smith
3. Bradford White
4. Bock
5. State
6. Rheem/Ruud
7. Or approved equivalent.

- B. Domestic Expansion Tanks ASME:

1. Bell and Gossett Series
2. American Wheatley
3. Amtrol
4. Armstrong
5. Watts
6. Hansen
7. Or approved equivalent.

- C. Domestic Circulation Pumps - Close-Coupled, In-Line:

1. Bell and Gossett Series
2. Armstrong
3. Grundfos
4. Paco
5. Taco



**SECTION 22 30 00  
PLUMBING EQUIPMENT**

**DIVISION 22**

- 6. Or approved equivalent.
- D. Garbage Disposal:
  - 1. In-Sink-Erator
  - 2. Salvajor
  - 3. Hobart
  - 4. Waste King
  - 5. Or approved equivalent.

**2.2 GENERAL**

- A. Reference Drawings for capacities and specific model numbers.

**2.3 COMMERCIAL LIGHT DUTY ELECTRIC STORAGE TYPE WATER HEATERS**

- A. System: Domestic Hot Water
- B. Entire unit is to be delivered complete with operating controls and require only plumbing and electrical service connections.
- C. Tank welded steel commercial construction designed for 150 PSI. Tank is to be lined with seamless Hydrastone cement to minimum thickness of 1/2-inch on 100 percent of interior tank surfaces, tank to be fabricated from solid copper-silicon and not require any type of anodic protection. Tank designed and fabricated with non-ferrous copper-silicon threaded tapings and non-ferrous inlet and outlet piping for maximum corrosion resistance. Steel tank tapings will not be acceptable. Entire tank is to be insulated with minimum of 2-inches thick polyurethane foam insulation and exceed latest ASHRAE standard for stand-by heat loss. Complete heater supplied with high impact colorized composite protective jacket which cannot rust or corrode and does not require painting.
- D. Cold water inlet 3/4-inch Female NPT (1-1/2-inch Male NPT) and include non-corrosive strata-flow diffuser which prevents incoming cold water from mixing too rapidly with hot water in tank. 3/4-inch hose connection drain is supplied. Hot water outlet 3/4-inch Male NPT (1-1/2-inch Male NPT) and includes factory installed built-in heat trap to prevent water from radiating through piping during stand-by periods. Separate 3/4-inch Female NPT tapping is to be provided for relief valve installation. An ASME rated automatic reseating combination temperature and pressure safety relief valve set at 150 PSI and 210 degrees F factory supplied.

**2.4 DOMESTIC EXPANSION TANKS ASME**

- A. System: Domestic water.
- B. Welded steel, constructed, tested and stamped in accordance with ASME Boiler and Pressure Vessel Code for working pressure of 125 PSI. Support floor mounted tanks with steel legs or base. Provide single flexible diaphragm securely sealed into tank to separate air charge from system water, to maintain design expansion capacity. Provide



## SECTION 22 30 00 PLUMBING EQUIPMENT

## DIVISION 22

pressure gauge and air-charging fitting, and drain fitting. Diaphragm: Removable and replaceable in line.

### 2.5 DOMESTIC CIRCULATION PUMPS - CLOSE-COUPLED, IN-LINE

- A. System: Domestic water
- B. Description: Factory-assembled and tested, single-stage, close-coupled, in-line, seal-less centrifugal pump.
  - 1. Pump and Motor Assembly: Hermetically sealed, replaceable-cartridge-type unit with motor and impeller on common shaft and designed for installation with pump and motor shaft mounted horizontally.
  - 2. Casing: Bronze/stainless steel, with threaded companion-flange connections.
  - 3. Impeller: Corrosion-resistant material.
  - 4. Motor: Non-overloading at any point on pump curve, Single speed, unless otherwise indicated. Comply with requirements in Division 22 Section "Common Motor Requirements."
- C. Capacities and Characteristics as per Drawings.
- D. See detail on Drawings for pump controls.

### 2.6 GARBAGE DISPOSAL

- A. Commercial Light Duty:
  - 1. General: Complete food waste disposal to include a stainless steel sink flange adapter assembly to match fixture. Stainless steel grind chamber, shredder ring, and two 360-degree swivel impellers. Continuous feed, automatic
  - 2. Stainless steel grind chamber, shredder ring, and two 360-degree swivel impellers. Continuous feed, automatic.
  - 3. Reversing split-phase motor, corrosion protection shield, and sound absorbing upper shell. UL listed.
  - 4. Warranty: Commercial 1 year parts and service.

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. Examine areas and conditions under which equipment is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.
- B. Install equipment in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances.



**SECTION 22 30 00  
PLUMBING EQUIPMENT**

**DIVISION 22**

- C. Orients so controls and devices needing service and maintenance have adequate access.
- D. Certificates: Submit appropriate Certificates of Shop Inspection and Data Report as required by provisions of ASME Boiler and Pressure Vessel Code.
- E. Connect water piping to units with shutoff valves and unions.
- F. Equipment Rigging: Heavy duty rigging eye bolts for Crosby Group swivel hoist rings installed over pump access covers for removal or maintenance.
- G. Equipment Start-Up:
  - 1. Start-up, test, and adjust equipment in accordance with manufacturer's start-up instructions. Check and calibrate controls.
  - 2. Start-up performed by authorized manufacturer's representative or agent. Provide credentials of start-up personnel to Architect and Owner's Authorized Representative for approval.
  - 3. Remove and replace filters when start-up testing is executed.
  - 4. Manufacturer adjusts operating parameters of equipment to compensate to elevation of 500-feet above sea level.
  - 5. Architect, Commissioning Agent, and Owner's Authorized Representative will be notified 10 days prior to start-up and will be present at start-ups.
  - 6. Provide written report from manufacturer's representative on results of start-up within 48 hours.
  - 7. Technical Training of maintenance staff includes two hours minimum per each piece of equipment.
  - 8. Seismic Verification:
    - a. Contractor will retain structural engineer who will submit stamped and signed anchoring and restraint details on plumbing equipment with submittal data in accordance with Division 22, Plumbing requirements.
    - b. Contractor's Structural Engineer will test and verify in writing that seismic restraints have been installed in accordance with their details.

**3.2 COMMERCIAL LIGHT DUTY ELECTRIC STORAGE TYPE WATER HEATERS**

- A. Examine areas and conditions under which equipment is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.
- B. Install equipment in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances.



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PLUMBING EQUIPMENT**

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- C. Orients so controls and devices needing service and maintenance have adequate access.
- D. Certificates: Submit appropriate Certificates of Shop Inspection and Data Report as required by provisions of ASME Boiler and Pressure Vessel Code.
- E. Connect water piping to units with shutoff valves and unions.

**3.3 DOMESTIC EXPANSION TANKS ASME**

- A. Precharge tank per manufacturers recommendation.
- B. Examine areas and conditions under which equipment is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.
- C. Install equipment in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances.
- D. Orients so controls and devices needing service and maintenance have adequate access.
- E. Certificates: Submit appropriate Certificates of Shop Inspection and Data Report as required by provisions of ASME Boiler and Pressure Vessel Code.
- F. Connect water piping to units with shutoff valves and unions.

**3.4 DOMESTIC CIRCULATION PUMPS - CLOSE-COUPLED, IN-LINE**

- A. Install equipment in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances.
- B. Orients so controls and devices needing service and maintenance have adequate access.
- C. Connect water piping to units with shutoff valves and unions.
- D. Provide lift check valves 5 diameters downstream of pump discharge for circulating pumps piped in a parallel configuration.
- E. Equipment Start-Up:
  - 1. Start-up, test, and adjust equipment in accordance with manufacturer's start-up instructions. Check and calibrate controls.
  - 2. Architect, Commissioning Agent, and Owner's Authorized Representative will be notified 10 days prior to start-up and will be present at start-ups.
  - 3. Seismic Verification:

- a. Contractor will retain structural engineer who will submit stamped and signed anchoring and restraint details on plumbing equipment with submittal data in accordance with Division 22, Plumbing requirements.
- b. Contractor's Structural Engineer will test and verify in writing that seismic restraints have been installed in accordance with their details.

**3.5 GARBAGE DISPOSAL**

- A. Examine areas and conditions under which equipment is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.
- B. Install complete food waste disposal system including water, waste connections, and electrical connection, including associated control devices. Install equipment in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances. Set devices and adjust any support or mounting assemblies per manufacturer's recommendations.
- C. Water supplies, as applicable are to be provided with shut-off valves, solenoid valves, backflow preventers and water hammer arrestors.
- D. Coordinate power requirements and connection methods with Division 26.
- E. Equipment Start-Up:
  1. Start-up, test, and adjust equipment in accordance with manufacturer's start-up instructions. Check and calibrate controls.
  2. Start-up performed by authorized manufacturer's representative or agent. Provide credentials of start-up personnel to Architect and Owner's Authorized Representative for approval.

**END OF SECTION**

**SECTION 22 40 00  
PLUMBING FIXTURES**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Work Included:
  - 1. General Plumbing Fixtures:
    - a. China Fixtures, White Only
    - b. Faucet Fittings
    - c. Stainless Steel Fixtures
    - d. Thermostatic Mixing Valves
  - 2. Carriers
  - 3. Drinking Fountains
  - 4. Electric Water Coolers
  - 5. Fixture Trim
  - 6. Floor Drains
  - 7. Flushometers - Water Closet/Urinal
  - 8. Water Closet Seats

**1.2 RELATED SECTIONS**

- A. Contents of Division 22, Plumbing and Division 01, General Requirements apply to this Section.

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

**1.4 SUBMITTALS**

- A. Submittals as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

**1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.



**SECTION 22 40 00  
PLUMBING FIXTURES**

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B. In addition, meet the following:

1. Comply with lead free (less than or equal to 0.25 percent) products in drinking water systems.
2. NSF 61, Annex G, Drinking Water System Components, Compliant.
3. ISO 9001, Quality Management Standard Certified.
4. IAPMO Low Lead Certification.
5. Provide fixtures, faucets and accessories to meet barrier free requirements of the governing code with respect to plumbing fixtures provided for the physically handicapped.
6. Items approved for use by State of California.

**1.6 WARRANTY**

A. Warranty of materials and workmanship as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

A. "Or approved equivalent" as defined in 22 00 00, Plumbing Basic Requirements. Substitution process requirements apply to approved equivalent products.

B. General Plumbing Fixtures: See Schedule on Drawings for type.

1. China Fixtures - White Only:
  - a. American Standard
  - b. Briggs
  - c. Crane
  - d. Eljer
  - e. Kohler
  - f. Universal-Rundle
  - g. Or approved equivalent.
2. Faucet Fittings:
  - a. Public:
    - 1) American Standard
    - 2) Chicago
    - 3) Delta Commercial
    - 4) Moen Commercial
    - 5) Sloan





**SECTION 22 40 00  
PLUMBING FIXTURES**

**DIVISION 22**

- 6) Symmons
    - 7) T & S Brass
    - 8) Or approved equivalent.
  3. Stainless Steel Fixtures:
    - a. Acorn Engineering
    - b. Haws
    - c. Zurn
    - d. Elkay
    - e. Or approved equivalent.
  4. Thermostatic Mixing Valves:
    - a. Bradley
    - b. Caleffi
    - c. Holby
    - d. Powers
    - e. Symmons
    - f. Or approved equivalent.
- C. Carriers:
  1. JR Smith
  2. Mifab
  3. Zurn
  4. Or approved equivalent.
- D. Drinking Fountain:
  1. Elkay
  2. Halsey-Taylor
  3. Haws
  4. Murdock
  5. Oasis
  6. Sunroc
  7. Or approved equivalent.
- E. Electric Water Coolers:
  1. Elkay
  2. Halsey-Taylor
  3. Haws
  4. Murdock
  5. Oasis

- 6. Sunroc
- 7. Or approved equivalent.
- F. Fixture Trim:
  - 1. McGuire
  - 2. Dearborn Brass
  - 3. Oatey
  - 4. Or approved equivalent.
- G. Floor Drains:
  - 1. Mifab
  - 2. Sioux Chief
  - 3. Smith
  - 4. Wade
  - 5. Watts
  - 6. Zurn
- H. Flushometers - Water Closet/Urinal:
  - 1. Delaney
  - 2. Sloan
  - 3. Zurn
  - 4. Or approved equivalent.
- I. Water Closet Seats:
  - 1. Bemis
  - 2. Or approved equivalent.

## **2.2 GENERAL PLUMBING FIXTURES**

- A. Review substitution request requirements in Division 01, General Requirements and 22 00 00, Plumbing General Requirements.
- B. Reference Architectural Details for mounting height and location of fixtures.
- C. Provide factory fabricated fixtures of type, style and material indicated on the plumbing fixture connection schedule shown on the Drawings. For each type fixture, provide fixture manufacturer's standard trim, carrier, seats, and valves as indicated by their published product information; either as designed and constructed, or as recommended by manufacturer, or required for complete installation. Where more than one type is indicated, selection is installer's option; but, fixtures of same type must be furnished by a single manufacturer. Where type is not otherwise indicated, provide fixtures complying with governing regulations.
- D. Provide fixtures complete with fittings, supports, fastening devices, bolt caps, faucets, valves, traps, stops and appurtenances.



## **SECTION 22 40 00 PLUMBING FIXTURES**

## **DIVISION 22**

### **E. Plumbing Fixture Flow Rates:**

1. Water Closets: Single flush at 1.28 GPF.
2. Lavatories in public core areas to be set for a maximum of 0.5 GPM flow. Other lavatories to be 1.0 GPM flow.
3. Sinks to be set for a maximum of 1.5 GPM flow.

### **F. Plumbing Fixture Thermostatic Mixing Valves:**

1. Lavatories provide ASSE 1070 compliant mixing valves or multiple lavatories served by a single ASSE 1070 compliant mixing valve.
2. Janitor sinks or process/maintenance type sinks do not require ASSE 1070 mixing valves if operated by trained personnel. Provide signage per Section 22 05 53, Identification for Plumbing Piping and Equipment.

## **2.3 CARRIERS**

### **A. Wall Hung Water Closets:**

1. Vertical: Zurn Z-1204-N4-X-50 or Z-1204-ND4-X-50 (JR Smith 230y-M54-M12 or 230DY-M54-M12). Adjustable vertical load siphon jet with 500 lb. capacity.
2. Horizontal: Zurn ZE-1203-N4-X-50 or ZE-1203-ND4-X-50 (JR Smith 220 R or L-Y-M54-M12 or 220DY-M54-M12). Adjustable horizontal siphon jet with 500 lb. load capacity.

### **B. Wall Hung Urinal: Zurn Z-1218-WS or Z-1222-WS. (JR Smith 637). Coupling type or plate type with bearing plate 200 lb. capacity.**

### **C. Wall Hung Lavatory: Zurn Z-1231 (D). (JR Smith 700). Concealed arm or Plate type, 250 lb. capacity.**

### **D. Wall Hung Drinking Fountain: Zurn Z-1225-BL (JR Smith 834-97-98). Plate type. 300 lb. capacity.**

## **2.4 DRINKING FOUNTAINS**

### **A. See Schedule on Drawings for type.**

## **2.5 ELECTRIC WATER COOLERS**

### **A. See Schedule on Drawings for type.**

## **2.6 FIXTURE TRIM**

### **A. Traps: Provide heavy duty commercial grade traps on fixtures except fixtures with integral traps. Exposed traps will be chromium plated cast brass or 17 gauge chromium plated brass tubing.**



## SECTION 22 40 00 PLUMBING FIXTURES

## DIVISION 22

1. Sink: McGuire 8912CDF.
2. Lavatory: McGuire 8902CDF.
- B. Supplies and Stops: Lead free heavy duty commercial grade, chrome plated with brass stems. Stops: T-handle or Loose Key type.
  1. Lavatory: McGuire LFH2165LK.
  2. Sink: McGuire LFH2167LK.
  3. Water Closets: McGuire.
- C. Lavatory Grid Strainer: McGuire 155A.
- D. Sink Grid Strainer: McGuire 152N.
- E. Sink Basket Strainer: McGuire 151.
- F. Trim barrier-free wrap for P-traps and supplies by McGuire, Pro-Wrap, Plumberex or Truebro.
- G. Escutcheons: McGuire wrought brass deep bell.
- H. Wax Rings and Toilet Bolts: WM Harvey No Seep No. 1 053065-N.

### 2.7 FLOOR DRAINS

- A. See Schedule on Drawings for types.

### 2.8 FLUSHOMETERS - WATER CLOSET/URINAL

- A. See Schedule on Drawings for types.

### 2.9 WATER CLOSET SEATS

- A. See Schedule on Drawings for type.

## PART 3 - EXECUTION

### 3.1 GENERAL PLUMBING FIXTURE INSTALLATION INFORMATION

- A. Verification of Conditions:
  1. Examine rough-in work of water supply and waste piping systems to verify actual locations of piping connections prior to installing fixtures. Examine floors and substrates, and conditions under which fixture work is to be accomplished. Correct any incorrect locations of piping and other unsatisfactory conditions for installation of plumbing fixtures.
  2. Examine walls, floors and cabinets for suitable conditions where fixtures are to be installed.

3. Install plumbing fixtures level and plumb, in accordance with fixture manufacturer's written instructions, rough-in drawings and pertinent codes and regulations, design and referenced standards.
  4. Fasten plumbing fixtures securely to supports or building structure. Secure supplies behind or within wall construction to provide rigid installation.
  5. Install a stop valve in a readily accessible location in water connection to each fixture.
  6. Install escutcheons at each wall, floor and ceiling penetration in exposed finished locations and within cabinets and millwork.
  7. Seal fixtures to walls and floors using silicone sealant Dow Corning No. 780 or approved equivalent. Match sealant color to fixture color.
  8. Test fixtures to demonstrate proper operation upon completion of installation and after units are water pressurized. Replace malfunctioning units, then retest.
  9. Inspect each unit for damage prior to installation. Replace damaged fixtures.
  10. Replace washers or cartridges of leaking or dripping faucets and stops.
  11. Clean fixtures, trim and strainers using manufacturer's recommended cleaning methods and materials.
  12. During construction, cover installed fixtures, drains, sinks and water coolers with cardboard and wrap with sheet plastic.
  13. Provide trap primers for floor drains, floor sinks, trench drains and hub drains.
  14. Install roof and overflow roof drains per architectural details. Cover drains during roof construction to protect drain. Provide offsets or expansion joints at each roof/overflow drain.
  15. Do not use lead flashing.
- B. Owner Furnished Equipment:
1. Rough-in and make final connections to Owner furnished equipment. Provide necessary items to complete installation.
  2. Comply with requirements of this Section and Drawings for installation procedures.
- C. Adjusting and Cleaning: Clean plumbing fixtures, trim, and strainers of dirt and debris upon completion of installation. Adjust water pressure at drinking fountains, faucets, shower valves and flush valves to provide proper flow stream and specified GPM. Repair leaks at faucets and stops.
- D. Extra Stock: Furnish special wrenches and other devices necessary for servicing plumbing fixtures and trim to Owner.

- E. Field Quality Control: Upon completion of installation of plumbing fixtures, test fixtures to demonstrate capability and compliance with Specifications. Correct or replace malfunctioning units at site, then retest to demonstrate compliance.
- F. Protection: Protect fixtures and equipment from damage. Cover finished fixtures with cardboard and sheet plastic. Fixtures are not to be used during construction. Replace damaged items with new.
- G. Signage: For fixtures that do not have ASSE 1070 mixing valve protection for hot water temperature, provide signage per Section 22 05 53, Identification for Plumbing Piping and Equipment.

### **3.2 CARRIERS INSTALLATION**

- A. Install components in accordance with manufacturer's instructions and approved product data submittals.
- B. Set plumb, level and rigid.
- C. Coordinate wall thickness so carrier has adequate depth to be concealed.

### **3.3 DRINKING FOUNTAINS INSTALLATION**

- A. Install components in accordance with manufacturer's instructions and approved product data submittals.
- B. Set plumb, level and rigid.

### **3.4 ELECTRIC WATER COOLERS INSTALLATION**

- A. Install components in accordance with manufacturer's instructions and approved product data submittals.
- B. Set plumb, level and rigid.

### **3.5 FIXTURE TRIM INSTALLATION**

- A. Install components in accordance with manufacturer's instructions and approved product data submittals.
- B. Set plumb, level and rigid.

### **3.6 FLOOR DRAINS INSTALLATION**

- A. Install components in accordance with manufacturer's instructions and approved product data submittals.
- B. Set plumb, level and rigid.



**SECTION 22 40 00  
PLUMBING FIXTURES**

**DIVISION 22**

**3.7 FLUSHOMETERS - WATER CLOSET/URINAL INSTALLATION**

- A. Install components in accordance with manufacturer's instructions and approved product data submittals.
- B. Set plumb, level and rigid.

**3.8 WATER CLOSET SEATS INSTALLATION**

- A. Install components in accordance with manufacturer's instructions and approved product data submittals.
- B. Set plumb, level and rigid.

**END OF SECTION**

**SECTION 23 00 00  
HEATING, VENTILATING AND AIR CONDITIONING (HVAC) BASIC REQUIREMENTS**

**PART 1 - GENERAL**

**1.1 SECTION INCLUDES**

- A. Work included in 23 00 00, HVAC Basic Requirements applies to Division 23, HVAC work to provide materials, labor, tools, permits, incidentals, and other services to provide and make ready for Owner's use of heating, ventilating and air conditioning systems for proposed project.
- B. Contract Documents include, but are not limited to, Specifications including Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Drawings, Addenda, Owner/Architect Agreement, and Owner/Contractor Agreement. Confirm requirements before commencement of work.
- C. Definitions:
  - 1. Provide: To furnish and install, complete and ready for intended use.
  - 2. Furnish: Supply and deliver to project site, ready for unpacking, assembly and installation.
  - 3. Install: Includes unloading, unpacking, assembling, erecting, installation, applying, finishing, protecting, cleaning and similar operations at project site as required to complete items of work provided.
  - 4. Approved or Approved Equivalent: To possess the same performance qualities and characteristics and fulfill the utilitarian function without any decrease in quality, durability or longevity. For equipment/products defined by the Contractor as "equivalent", substitution requests must be submitted to Engineer for consideration, in accordance with Division 01, General Requirements, and approved by the Engineer prior to submitting bids for substituted items.
  - 5. Authority Having Jurisdiction (AHJ): Indicates reviewing authorities, including local fire marshal, Owner's insurance underwriter, Owner's Authorized Representative, and other reviewing entity whose approval is required to obtain systems acceptance.

**1.2 RELATED SECTIONS**

- A. Contents of Section applies to Division 23, HVAC Contract Documents.
- B. Related Work:
  - 1. Additional conditions apply to this Division including, but not limited to:
    - a. Specifications including Division 00, Procurement and Contracting Requirements and Division 01, General Requirements.
    - b. Drawings





**SECTION 23 00 00  
HEATING, VENTILATING, AND  
AIR CONDITIONING (HVAC)  
BASIC REQUIREMENTS**

**DIVISION 23**

- c. Addenda
- d. Owner/Architect Agreement
- e. Owner/Contractor Agreement
- f. Codes, Standards, Public Ordinances and Permits

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards per Division 01, General Requirements, individual Division 23, HVAC Sections and those listed in this Section.
- B. Codes to include latest adopted editions, including current amendments, supplements and local jurisdiction requirements in effect as of the date of the Contract Documents, of/from:
  - 1. State of California:
    - a. CBC - California Building Code
    - b. CEC - California Electrical Code
    - c. CEC T24 - California Energy Code Title 24
    - d. CFC - California Fire Code
    - e. CMC - California Mechanical Code
    - f. CPC - California Plumbing Code
    - g. CSFM - California State Fire Marshal
- C. Reference standards and guidelines include but are not limited to the latest adopted editions from:
  - 1. ABA - Architectural Barriers Act
  - 2. ABMA - American Bearing Manufacturers Association
  - 3. ADA - Americans with Disabilities Act
  - 4. AHRI - Air-Conditioning Heating & Refrigeration Institute
  - 5. AMCA - Air Movement and Control Association
  - 6. ANSI - American National Standards Institute
  - 7. ASCE - American Society of Civil Engineers
  - 8. ASHRAE - American Society of Heating, Refrigeration and Air-Conditioning Engineers



**SECTION 23 00 00  
HEATING, VENTILATING, AND  
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9. ASHRAE Guideline 0, The Commissioning Process
10. ASME - American Society of Mechanical Engineers
11. ASPE - American Society of Plumbing Engineers
12. ASSE - American Society of Sanitary Engineering
13. ASTM - ASTM International
14. AWWA - American Water Works Association
15. CFR - Code of Federal Regulations
16. CISPI - Cast Iron Soil Pipe Institute
17. EPA - Environmental Protection Agency
18. ETL - Electrical Testing Laboratories
19. FM - FM Global
20. HI - Hydraulic Institute Standards
21. IAPMO - International Association of Plumbing & Mechanical Officials
22. ISO - International Organization for Standardization
23. MSS - Manufacturers Standardization Society
24. NEC - National Electric Code
25. NEMA - National Electrical Manufacturers Association
26. NFPA - National Fire Protection Association
27. NFGC - National Fuel Gas Code
28. NRCA - National Roofing Contractors Association
29. NSF - National Sanitation Foundation
30. OSHA - Occupational Safety and Health Administration
31. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association, Inc.
32. TIMA - Thermal Insulation Manufacturers Association
33. UL - Underwriters Laboratories, Inc.

D. See Division 23, HVAC individual Sections for additional references.



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**1.4 SUBMITTALS**

- A. See Division 01, General Requirements for Submittal Procedures as well as specific individual Division 23, HVAC Sections.
- B. Provide drawings in format and software release equal to the design documents. Drawings to be the same sheet size and scale as the Contract Documents.
- C. In addition:
  - 1. "No Exception Taken" constitutes that review is for general conformance with the design concept expressed in the Contract Documents for the limited purpose of checking for conformance with information given. Any action is subject to the requirements of the Contract Documents. Contractor is responsible for the dimensions and quantity and will confirm and correlate at the job site, fabrication processes and techniques of construction, coordination of the work with that of all other trades, and the satisfactory performance of the work.
  - 2. Provide product submittals and shop drawings in electronic format only. Electronic format must be submitted via zip file via e-mail and be native/searchable PDF format. Scanned copies are not acceptable. For electronic format, provide one file per division containing one bookmarked PDF file with each bookmark corresponding to each Specification Section. Arrange bookmarks in ascending order of Specification Section number. Individual submittals sent piecemeal in a per Specification Section method will be returned without review or comment. All transmissions/submissions to be submitted to Architect. At Contractor's option, four separate submittals may be provided, consisting of long lead items, underground/site work, building work, and building automation system. Deviations will be returned without review.
  - 3. Product Data: Provide Manufacturer's descriptive literature for products specified in Division 23, HVAC Sections.
  - 4. Identify/mark each submittal in detail. Note what differences, if any, exist between the submitted item and the specified item. Failure to identify the differences will be considered cause for disapproval. If differences are not identified and/or not discovered during the submittal review process, Contractor remains responsible for providing equipment and materials that meet the Specifications and Drawings.
    - a. Label submittal to match numbering/references as shown in Contract Documents. Highlight and label applicable information to individual equipment or cross out/remove extraneous data not applicable to submitted model. Clearly note options and accessories to be provided, including field installed items. Highlight connections by/to other trades.
    - b. Include technical data, installation instructions and dimensioned drawings for products, fixtures, equipment and devices installed, furnished or provided. Reference individual Division 23, HVAC Specification Sections for specific items required in product data submittal outside of these requirements.
    - c. Provide fan curves, operation characteristics, capacities, ambient noise criteria, etc. for equipment.



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- d. For vibration isolation of equipment, list make and model selected with operating load and deflection.
  - e. See Division 23, HVAC individual Sections for additional submittal requirements outside of these requirements.
5. Maximum of two reviews of submittal package. Arrange for additional reviews and/or early review of long-lead items; bear costs of these additional reviews at Engineer's hourly rates. Incomplete submittal packages/submittals will be returned to contractor without review.
6. Structural/Seismic: Provide weights, dimensions, mounting requirements and like information required for mounting, seismic bracing, and support. Indicate manufacturer's installation and support requirements to meet ASCE 7-16 requirements for non-structural components. Provide engineered seismic drawings and equipment seismic certification. Equipment Importance Factor as specified in Division 01 and in Structural documents.
7. Trade Coordination: Include physical characteristics, electrical characteristics, device layout plans, wiring diagrams, and connections as required by Division 23, HVAC Coordination Documents. For equipment with electrical connections, furnish copy of approved submittal for inclusion in Division 26, Electrical submittals.
8. Make provisions for openings in building for admittance of equipment prior to start of construction or ordering of equipment.
9. Substitutions and Variation from Basis of Design:
- a. The Basis of Design designated product establishes the qualities and characteristics for the evaluation of any comparable products by other listed acceptable manufacturers if included in this Specification or included in an approved Substitution Request as judged by the Design Professional.
  - b. If substitutions and/or equivalent equipment/products are being proposed, it is the responsibility of parties proposing the substitute and/or equivalent equipment to verify and compare the characteristics and requirements of that furnished to that specified and/or shown. If greater capacity and/or more materials and/or more labor is required for the rough-in, circuitry or connections than for the item specified and provided for, then provide compensation for additional charges required for the proper rough-in, circuitry and connections for the equipment being furnished. No additional charges above the Base Bid, including resulting charges for work performed under other Divisions, will be allowed for such revisions. Coordinate with the requirements of "Submittals." For any product marked "or approved equivalent," a substitution request must be submitted to Engineer for approval prior to bid.
10. Shop Drawings: Provide coordinated shop drawings which include physical characteristics of all systems, equipment, ductwork and piping layout plans, and control wiring diagrams. Reference individual Division 23, HVAC Specification Sections for additional requirements for shop drawings outside of these requirements.



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- a. Provide Shop Drawings indicating access panel locations for items that require Code or maintenance access, size and elevation for approval prior to installation.
- 11. Samples: Provide samples when requested by individual Sections.
- 12. Resubmission Requirements:
  - a. Make corrections or changes in submittals as required in response to Engineer's comments. Provide a cover letter with resubmittal that includes responses to each of the Engineer's submittal review comments and identifies changes in the resubmittal. Cloud changes in the submittals.
    - 1) Resubmit for review until review indicates "no exception taken" or "make corrections noted."
    - 2) When submitting drawings for Engineer's re-review, clearly indicate changes on drawings and cloud any revisions. Submit a list describing each change.
- 13. Operation and Maintenance Manuals, Owner's Instructions:
  - a. Submit, at one time, electronic files (native/searchable PDF format) of manufacturer's operation and maintenance instruction manuals and parts lists for equipment or items requiring servicing. Submit data when work is substantially complete and in same order format as submittals. Include name and location of source parts and service for each piece of equipment.
    - 1) Include copy of approved submittal data along with submittal review letters received from Engineer. Data to clearly indicate installed equipment model numbers. Delete or cross out data pertaining to other equipment not specific to this project.
    - 2) Include copy of manufacturer's standard Operations and Maintenance for equipment. At front of each tab, provide routine maintenance documentation for scheduled equipment. Include manufacturer's recommended maintenance schedule and highlight maintenance required to maintain warranty. Furnish list of routine maintenance parts, including part numbers, sizes, quantities, relevant to each piece of equipment: belts, motors, lubricants, and filters.
    - 3) Include Warranty per Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 23 00 00, HVAC Basic Requirements and individual Sections.
    - 4) Include product certificates of warranties and guarantees.
    - 5) Include copy of complete parts list for equipment. Include available exploded views of assemblies and sub assemblies.



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- 6) Include copy of startup and test reports specific to each piece of equipment.
  - 7) Include copy of final air systems balancing log along with fan and distribution system operating data.
  - 8) Include commissioning reports.
  - 9) Engineer will return incomplete documentation without review. Engineer will provide one set of review comments in Submittal Review format. Contractor must arrange for additional reviews; Contractor to bear costs for additional reviews at Engineer's hourly rates.
- b. Thoroughly instruct Owner in proper operation of equipment and systems. Where noted in individual Sections, training will include classroom instruction with applicable training aids and systems demonstrations. Field instruction per Section 23 00 00, HVAC Basic Requirements Article titled "Demonstration."
  - c. Copies of certificates of code authority inspections, acceptance, code required acceptance tests, letter of conformance and other special guarantees, certificates of warranties, specified elsewhere or indicated on Drawings.
14. Record Drawings:
- a. Maintain at site at least one set of drawings for recording "As-constructed" conditions. Indicate on drawings changes to original documents by referencing revision document, and include buried elements, location of cleanouts, and location of concealed mechanical items. Include items changed by field orders, supplemental instructions, and constructed conditions.
  - b. Record Drawings are to include equipment and fixture/connection schedules, control dampers, fire smoke dampers, fire dampers, valves, bottom of pipe, duct and equipment elevations and dimensioned locations for all distribution systems (hydronic and air). Invert elevations and dimensioned locations for underground systems below grade to 5-feet outside building that accurately reflect "as constructed or installed" for project.
  - c. At completion of project, input changes to original project CAD Drawings and make one set of black-line drawings created from CAD Files in version/release equal to contract drawings. Submit CAD Files and drawings upon substantial completion.
  - d. See Division 23, HVAC individual Sections for additional items to include in record drawings.



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**1.5 QUALITY ASSURANCE**

- A. Regulatory Requirements: Work and materials installed to conform with all local, State and Federal codes, and other applicable laws and regulations. Where code requirements are at variance with Contract Documents, meet code requirements as a minimum requirement and include costs necessary to meet these in Contract. Machinery and equipment are to comply with OSHA requirements, as currently revised and interpreted for equipment manufacturer requirements. Install equipment provided per manufacturer recommendations.
- B. Whenever this Specification calls for material, workmanship, arrangement or construction of higher quality and/or capacity than that required by governing codes, higher quality and/or capacity take precedence.
- C. Drawings are intended to be diagrammatic and reflect the Basis of Design manufacturer's equipment. They are not intended to show every item in its exact dimensions, or details of equipment or proposed systems layout. Verify actual dimensions of systems (i.e., piping) and equipment proposed to assure that systems and equipment will fit in available space. Contractor is responsible for design and construction costs incurred for equipment other than Basis of Design, including, but not limited to, architectural, structural, electrical, HVAC, fire sprinkler, and plumbing systems.
- D. Manufacturer's Instructions: Follow manufacturers' written instructions. If in conflict with Contract Documents, obtain clarification. Notify Engineer/Architect, in writing, before starting work.
- E. Items shown on Drawings are not necessarily included in Specifications or vice versa. Confirm requirements in all Contract Documents.
- F. Provide products that are UL listed.
- G. Piping and duct insulation products to contain less than 0.1 percent by weight PBDE in all insulating materials.

**1.6 WARRANTY**

- A. Provide written warranty covering the work for a period of one year from date of Substantial Completion in accordance with Division 00, Contracting and Procurement Requirements, Division 01, General Requirements, Section 23 00 00, HVAC Basic Requirements and individual Division 23, HVAC Sections.
- B. Sections under this Division can require additional and/or extended warranties that apply beyond basic warranty under Division 01, General Requirements and the General Conditions. Confirm requirements in all Contract Documents.

**1.7 COORDINATION DOCUMENTS**

- A. Prior to construction, prepare and submit coordinated layout drawings (composite drawings), to coordinate installation and location of ductwork, grilles, diffusers, piping, fire sprinklers, plumbing, lights, and electrical services. Composite Drawings show services on single sheet. Key Drawings to structural column identification system. Prior to completion of Drawings, coordinate proposed installation with architectural and structural requirements, and other trades (including plumbing, HVAC, fire protection, electrical,



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ceiling suspension, and ceiling tile systems, etc.), and provide maintenance access requirements. Coordinate with submitted architectural systems (i.e. roofing, ceiling, finishes) and structural systems as submitted, including footings and foundation. Identify zone of influence from footings and ensure systems are not routed within the zone of influence.

**B. Prepare Drawings as follows:**

1. Drawings in CAD format. CAD format release equal to design documents. Drawings to be same sheet size and scale as Contract Drawings and indicate location, size, and elevation above finished floor of equipment and distribution systems.
2. Review and revise, as necessary, section cuts in Contract Drawings after verification of field conditions.
3. Indicate air distribution system piping including fittings, hangers, access panels, valves, and bottom of pipe and duct elevations above finished floor.
4. Indicate inverts and provision for piping that must be graded to have right-of-way over more flexible items. Drawings also to indicate proposed ceiling grid and lighting layout as shown on electrical drawings and architectural reflected ceiling drawings and HVAC equipment, ductwork and piping.
5. Incorporate Addenda items and change orders.
6. Distribute drawings to trades and provide additional coordination as requested by other trades.

**C. Advise Architect in event conflict occurs in location or connection of equipment. Bear costs resulting from failure to properly coordinate installation or failure to advise Architect of conflict.**

**D. Submit final Coordination Drawings with changes as Record Drawings at completion of project.**

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Articles, fixtures, and equipment of a kind to be standard product of one manufacturer, including but not limited to pumps, fans, valves, control devices, air handlers, vibration isolation devices, etc.**

**2.2 STANDARDS OF MATERIALS AND WORKMANSHIP**

- A. Base contract upon furnishing materials as specified. Materials, equipment, and fixtures used for construction are to be new, latest products as listed in manufacturer's printed catalog data and are to be UL or ETL listed and labeled or be approved by State, County, and City authorities prior to procurement and installation.**
- B. Names and manufacturer's names denote character and quality of equipment desired and are not to be construed as limiting competition.**





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- C. Hazardous Materials:
1. Comply with local, State of California, and Federal regulations relating to hazardous materials.
  2. Comply with Division 00, Procurement and Contracting Requirements and Division 01, General Requirements for this project relating to hazardous materials.
  3. Do not use any materials containing a hazardous substance. If hazardous materials are encountered, do not disturb; immediately notify Owner and Architect. Hazardous materials will be removed by Owner under separate contract.

**2.3 ACCESS PANELS**

- A. Confirm Access Panel requirements in Division 01, General Requirements, Division 08, Openings and individual Division 23, HVAC Sections. In absence of specific requirements in Division 01, General Requirements, comply with the following:
1. Provide flush mounting access panels for service of systems and individual components requiring maintenance or inspection. Where access panels are located in fire-rated assemblies of building, rate access panels accordingly.
    - a. Ceiling access panels to be minimum 24-inch by 24-inch required and approved size.
    - b. Wall access panels to be minimum of 12-inch by 12-inch required and approved size.
    - c. Provide screwdriver operated catch.
    - d. Manufacturers and Models:
      - 1) Drywall: Karp KDW.
      - 2) Plaster: Karp DSC-214PL.
      - 3) Masonry: Karp DSC-214M.
      - 4) 2 hour rated: Karp KPF-350FR.
      - 5) Manufacturers: Milcor, Elmdor, Acudor or approved equivalent.

**PART 3 - EXECUTION**

**3.1 ACCESSIBILITY AND INSTALLATION**

- A. Confirm Accessibility and Installation requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 23 00 00, HVAC Basic Requirements and individual Division 23, HVAC Sections.



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- B. Install equipment having components requiring access (i.e., drain pans, drains, control operators, valves, motors and vibration isolation devices) so that they may be serviced, reset, replaced or recalibrated by service people with normal service tools and equipment. Do not install equipment in obvious passageways, doorways, scuttles or crawlspaces which would impede or block intended usage.
- C. Install equipment and products complete as directed by manufacturer's installation instructions including all appurtenances recommended in manufacturer's installation instructions, at no additional charge to Owner. Obtain installation instructions from manufacturer prior to rough-in of equipment and examine instructions thoroughly. When requirements of installation instructions conflict with Contract Documents, request clarification from Architect prior to proceeding with installation. This includes proper installation methods, sequencing and coordination with other trades and disciplines.
- D. Firestopping:
  - 1. Confirm Firestopping requirements in Division 07, Thermal and Moisture Protection. In absence of specific requirements, comply with individual Division 23, HVAC Sections and the following:
    - a. Coordinate location and protection level of fire and/or smoke rated walls, ceilings, and floors. When these assemblies are penetrated, seal around piping, ductwork and equipment with approved firestopping material. Install firestopping material complete as directed by manufacturer's installation instructions. Meet requirements of ASTM E814, Standard Test Method for Fire Tests of Through-Penetration Fire Stops.
- E. Pipe Installation:
  - 1. Provide installation of piping systems coordinated to account for expansion and contraction of piping materials and building, as well as anticipated settlement or shrinkage of building. Install work to prevent damage to piping, equipment, and building and its contents. Provide piping offsets, loops, seismic flexible joints, expansion joints, sleeves, anchors or other means to control pipe movement and minimize forces on piping. Verify anticipated settlement and/or shrinkage of building with Project Structural Engineer. Verify construction phasing, type of building construction products and rating for coordinating installation of piping systems.
  - 2. Include provisions for servicing and removal of equipment without dismantling piping.
- F. Plenums:
  - 1. Plenums: Materials within plenums shall be noncombustible or shall have a flame spread index of not more than 25 and a smoke-developed index of not more than 50 when tested in accordance with ASTM E 84 or UL 723. Immediately notify Architect/Engineer of any discrepancy.
- G. Provide miscellaneous supports/metals required for installation of equipment, piping, and ductwork.



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**3.2 SEISMIC CONTROL**

- A. Confirm Seismic Control requirements in Division 01, General Requirements, Structural documents, and individual Division 23 HVAC Sections.
- B. Seismic Design Category: E.
- C. Building Occupancy Category: II.
- D. General:
  - 1. Earthquake resistant designs for HVAC (Division 23) equipment and distribution, i.e. motors, ductwork, piping, equipment, etc. to conform to regulations of jurisdiction having authority.
  - 2. Restraints which are used to prevent disruption of function of piece of equipment because of application of horizontal force to be such that forces are carried to frame of structure in such a way that frame will not be deflected when apparatus is attached to a mounting base and equipment pad, or to structure in normal way, utilizing attachments provided. Secure equipment and distribution systems to withstand a force in direction equal to value defined by jurisdiction having authority.
  - 3. Provide stamped Shop Drawings from licensed Structural Engineer of seismic bracing and seismic movement assemblies for piping equipment and water heaters. Submit Shop Drawings along with equipment submittals.
  - 4. Provide stamped Shop Drawings from licensed Structural Engineer of seismic flexible joints for piping and crossing building expansion or seismic joints. Submit Shop Drawings along with seismic bracing details.
- E. Piping and Ductwork:
  - 1. Per "Seismic Restraints Manual Guidelines for Mechanical Systems" latest edition published by SMACNA or local requirements.
- F. Provide means to prohibit excessive motion of mechanical equipment during earthquake.

**3.3 REVIEW AND OBSERVATION**

- A. Confirm Review and Observation requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 23 00 00, HVAC Basic Requirements and individual Division 23, HVAC Sections.
- B. Notify Architect, in writing, at following stages of construction so that they may, at their option, visit site for review and construction observation:
  - 1. Underground system installation prior to backfilling.
  - 2. Prior to covering walls.
  - 3. Prior to ceiling cover/installation.



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4. After major equipment is installed.
  5. When main systems, or portions of, are being tested and ready for inspection by AHJ.
- C. Final Punch:
1. Prior to requesting a final punch visit from the Engineer, request from Engineer the Mechanical Precloseout Checklist, complete the checklist confirming completion of systems' installation, and return to Engineer. Request a final punch visit from the Engineer, upon Engineer's acceptance that the mechanical systems are ready for final punch.
  2. Costs incurred by additional trips required due to incomplete systems will be the responsibility of the To Be Determined Contractor.

**3.4 CUTTING AND PATCHING**

- A. Confirm Cutting and Patching requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with individual Division 23, HVAC Sections and the following:
1. Proposed floor cutting/core drilling/sleeve locations to be approved by Project Structural Engineer. Submit proposed locations to Architect/Project Structural Engineer. Where slabs are of post tension construction, perform x-ray scan of proposed penetration locations and submit scan results including proposed penetration locations to Project Structural Engineer/Architect for approval. Where slabs are of waffle type construction, show column cap extent and cell locations relative to proposed penetration(s).
  2. Cutting, patching and repairing for work specified in this Division including plastering, masonry work, concrete work, carpentry work, and painting included under this Section will be performed by skilled craftspeople of each respective trade in conformance with appropriate Division of Work.
  3. Additional openings required in building construction to be made by drilling or cutting. Use of jack hammer is specifically prohibited. Patch openings in and through concrete and masonry with grout.
  4. Restore new or existing work that is cut and/or damaged to original condition. Patch and repair specifically where existing items have been removed. This includes repairing and painting walls, ceilings, etc. where existing conduit and devices are removed as part of this project. Where alterations disturb lawns, paving, and walks, surfaces to be repaired, refinished and left in condition matching existing prior to commencement of work.
  5. Additional work required by lack of proper coordination will be provided at no additional cost to the Owner.

**3.5 EQUIPMENT SELECTION AND SERVICEABILITY**

- A. Replace or reposition equipment which is too large or located incorrectly to permit servicing, at no additional cost to Owner.



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- B. Maintain design intent where equipment other than as shown as Basis of Design in Contract Documents is provided. Where equipment requires ductwork or piping arrangement, controls/control diagrams, or sequencing different from that indicated in Contract Documents, provide at no additional cost to Owner.

**3.6 DELIVERY, STORAGE AND HANDLING**

- A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with individual Division 23, HVAC Sections and the following:
  - 1. Handle materials delivered to project site with care to avoid damage. Store materials on site inside building or protected from weather, dirt and construction dust. Insulation and lining that becomes wet from improper storage and handling to be replaced before installation. Products and/or materials that become damaged due to water, dirt, and/or dust as a result of improper storage to be replaced before installation.
  - 2. Protect equipment and pipe to avoid damage. Close pipe openings with caps or plugs. Keep motors and bearings in watertight and dustproof covers during entire course of installation.
  - 3. Protect bright finished shafts, bearing housings and similar items until in service.

**3.7 DEMONSTRATION**

- A. Confirm Demonstration requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 23 00 00, HVAC Basic Requirements and individual Division 23, HVAC Sections.
- B. Upon completion of work and adjustment of equipment and test systems, demonstrate to Owner's Authorized Representative, Architect and Engineer that equipment furnished and installed or connected under provisions of these Specifications functions in manner required. Provide field instruction to Owner's Maintenance Staff as specified in Division 01, General Requirements, Section 23 00 00, HVAC Basic Requirements and individual Division 23, HVAC Sections.
- C. Manufacturer's Field Services: Furnish services of a qualified person at time approved by Owner, to instruct maintenance personnel, correct defects or deficiencies, and demonstrate to satisfaction of Owner that entire system is operating in satisfactory manner and complies with requirements of other trades that may be required to complete work. Complete instruction and demonstration prior to final job site observations.

**3.8 CLEANING**

- A. Confirm Cleaning requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 23 00 00, HVAC Basic Requirements and individual Division 23, HVAC Sections.
- B. Upon completion of installation, thoroughly clean exposed portions of equipment, removing temporary labels and traces of foreign substances. Throughout work, remove construction debris and surplus materials accumulated during work.



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**3.9 START UP**

- A. Start up equipment, in accordance with manufacturer's start-up instructions, and in presence of manufacturer's representative. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.
  - 1. Do not place equipment in sustained operation prior to initial balancing of HVAC systems.

**3.10 PAINTING**

- A. Confirm Painting requirements in Division 01, General Requirements and Division 09, Finishes. In absence of specific requirements, comply with individual Division 23, HVAC Sections and the following:
  - 1. Ferrous Metal: After completion of work, thoroughly clean and paint exposed supports constructed of ferrous metal surfaces in mechanical rooms, i.e., hangers, hanger rods, equipment stands, with one coat of black asphalt varnish for exterior or black enamel for interior, suitable for hot surfaces.
  - 2. After acceptance by Authority Having Jurisdiction (AHJ), In a mechanical room, on roof or other exposed areas, machinery and equipment not painted with enamel to receive two coats of primer and one coat of rustproof enamel, colors as selected by Architect.
  - 3. See individual equipment Specifications for other painting.
  - 4. Structural Steel: Repair damage to structural steel finishes or finishes of other materials damaged by cutting, welding or patching to match original.
  - 5. Piping and Ductwork: Clean, primer coat and paint exposed piping and ductwork on roof or at other exterior locations with two coats paint suitable for metallic surfaces and exterior exposures. Color selected by Architect.
  - 6. Covers: Covers such as manholes, cleanouts and the like will be furnished with finishes which resist corrosion and rust.

**3.11 ACCESS PANELS**

- A. Confirm Access Panel requirements in Division 01, General Requirements. In absence of specific requirements, comply with individual Division 23, HVAC Sections and the following:
  - 1. Coordinate locations/sizes of access panels with Architect prior to work.

**3.12 ACCEPTANCE**

- A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with individual Division 23, HVAC Sections and the following:
  - 1. System cannot be considered for acceptance until work is completed and demonstrated to Architect that installation is in strict compliance with



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Specifications, Drawings and manufacturer's installation instructions, particularly in reference to following:

- a. Testing and Balancing Reports
- b. Cleaning
- c. Operation and Maintenance Manuals
- d. Training of Operating Personnel
- e. Record Drawings
- f. Warranty and Guaranty Certificates
- g. Start-up/Test Document
- h. Commissioning Reports

**3.13 FIELD QUALITY CONTROL**

- A. Confirm Field Quality Control requirements in Division 01, General Requirements, Section 23 00 00, HVAC Basic Requirements and individual Division 23, HVAC Sections.
- B. Tests:
  - 1. Conduct tests of equipment and systems to demonstrate compliance with requirements specified. Reference individual Specification Sections for required tests. Document tests and include in Operation and Maintenance Manuals.
  - 2. During site evaluations by Architect or Engineer, provide appropriate personnel with tools to remove and replace trims, covers, and devices so that proper evaluation of installation can be performed.

**3.14 LETTER OF CONFORMANCE**

- A. Provide Letter of Conformance, copies of manufacturers' warranties and extended warranties with a statement that HVAC items were installed in accordance with manufacturer's recommendations, UL listings and FM Global approvals. Include Letter of Conformance, copies of manufacturers' warranties and extended warranties in Operation and Maintenance Manuals.

**3.15 ELECTRICAL INTERLOCKS**

- A. Where equipment motors are to be electrically interlocked with other equipment for simultaneous operation, utilize equipment wiring diagrams to coordinate with electrical systems so that proper wiring of equipment involved is affected.

**3.16 TEMPORARY HEATING, COOLING AND HUMIDITY CONTROL**

- A. Provide temporary heating, cooling, controls, humidification and dehumidification as required to facilitate the construction of the project. Size and select temporary system based on the requirements of the various trades during construction. This includes, but is



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not limited to, drywall, case work, wood flooring and wood finishes that are subject to warping. Size and install system to prevent mold growth. Coordinate the location of the temporary system. The house system can be used. Develop a procedure for how the house system will be used including a sketch depicting the house system, how filtration will be used to prevent construction debris from entering the system and how often the filters will be changed, how the ductwork will be cleaned after use to ensure a clean system is turned over to the Owner and how the units are sized. Submit this procedure to the Mechanical Engineer for review. Follow National Air Duct Cleaners Association (NADCA) duct cleaning procedures and guidelines. Warranties for the house system, if new, to commence when the Owner moves in if house system is used as the means to maintain the climate within the building during construction. Include this warranty requirement in the original bid or proposal amount. Coordinate and provide any temporary power, controls, ductwork, piping, plumbing anchorage, miscellaneous steel and structural supports required to support the temporary system. Installation of the system to comply with all applicable codes and be acceptable to the Authority Having Jurisdiction (AHJ).

**END OF SECTION**



**SECTION 23 05 13  
COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Work Included:
  - 1. Starters
  - 2. Shaft Grounding
  - 3. Motors

**1.2 RELATED SECTIONS**

- A. Contents of Division 23, HVAC and Division 01, General Requirements apply to this Section.

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.
- B. In addition, meet the following:
  - 1. NEMA Premium Efficiency
  - 2. Energy Policy Act (EPACT), latest applicable version(s) for minimum motor efficiencies.

**1.4 SUBMITTALS**

- A. Submittals as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

**1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.
- B. In addition, meet the following:
  - 1. Field Installed Motors: Installed motors to be of single type, from one source and from a single manufacturer.
  - 2. Electrical components and materials to be UL and ETL listed/labeled as suitable for location and use.



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**1.6 WARRANTY**

- A. Warranty of materials and workmanship as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.
- B. In addition, provide:
  - 1. For motors 50 HP and larger, provide 5-year manufacturer's limited warranty from date of substantial completion.

**PART 2 - PRODUCTS**

**2.1 STARTERS**

- A. Manufacturers
  - 1. Cerus
  - 2. Eaton Electrical
  - 3. General Electric
  - 4. Siemens
  - 5. Schneider Electric/Square D
- B. Single Phase Motors:
  - 1. Manual across-the-line starting switch having toggle-operated switch pilot running light and built-in thermal overload device with heating element rated not more than 115 percent motor full load current indicated on name plate of motor to be protected. Surface mount starters. Provide NEMA-1 enclosure.
  - 2. Overload relays to be melting alloy type with a replaceable control circuit module. Thermal units to be interchangeable. Starter to be non operative if thermal unit is removed.
  - 3. Single-phase motors with automatic controls. Provide motor-rated relay with coils rated for control voltage.
- C. Starters up to Size 8 to be suitable for the addition of a minimum of three external auxiliary contacts (normally open or normally closed). Contactor, coils, and relays to perform the control functions of the associated equipment and control sequence.
- D. Three Phase Motors up to and Including 15 HP:
  - 1. Provide enclosed type magnetic across-the-line starter with thermal overload and undervoltage protection.
  - 2. Operator: "Start-Stop" pushbutton, except where automatic control is indicated on Drawings or specified. Then provide "Hand-Off-Auto" selector switch.



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3. Starters for 3-phase motors to have overload protection in each of the three legs, with external manual reset.
4. Unless indicated on Drawings or in Specifications, furnish motor starters with a neon pilot light. Neon lights are required for exhaust fan switches.
5. Equip starters with integral transformer and coil for control circuit. Coordinate coil voltage with control voltage.

**2.2 SHAFT GROUNDING**

- A. Manufacturers
  1. Shaft Grounding Inc.
  2. Aegis SGR Bearing Protection Ring
  3. Or approved equivalent.
- B. Variable Speed Motor Shaft Grounding: Shaft grounding ring; solid ring type.
- C. Provide shaft grounding assembly on motors controlled by variable frequency drive. Shaft grounding device to be in the form of brush that resides on the motor shaft. Brush assembly shall be capable of tolerating misalignment and maintaining rotating contact throughout the motors life.
- D. Material: Material used in the grounding assembly shall be stable material commonly used within industry that is not believed to constitute a hazardous material under Occupational Safety & Health Administration (OSHA) regulations.
- E. Brushes: Specifically developed carbon compounds of sustained performance with wear life expectancy of 3 years minimum.
- F. Seals: Sealed type to keep contaminants from entering the shaft grounding system in wet or severe environment applications.
- G. Shaft Grounding Assembly: For clean room air handling systems, use the type that contains the wear products within a special enclosure within the shaft grounding system.

**2.3 MOTORS**

- A. Manufacturers:
  1. Lincoln Motor
  2. Century Electric Motors (formerly A.O. Smith Electrical Products)
  3. Baldor Electric
  4. General Electric



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5. Toshiba
  6. Exception: Motors integral to equipment efficiency listing (EER, COP, etc.) per listing agency.
- B. Construction:
1. Open drip-proof type except where specifically noted otherwise.
  2. Design for continuous operation in 40 degrees C environment.
  3. Design for temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.
  4. Built-in thermal overload protection or externally protected with separate overload with low-voltage release or lock-out. Quick trip device on hermetically sealed motors.
  5. Service Factor: 1.15 for poly-phase motors except 1.25 for motors associated with shaft pressurization system fans and 1.35 for single phase motors.
  6. Efficiency: Provide NEMA Premium Efficiency motors.
  7. Motors used in conjunction with variable speed drives: Variable torque type matched for the full operating range of the variable frequency drive. As a minimum, motors to have Class F insulation, winding insulation rated for 1000 Volts and insulated bearings to prevent high frequency ground path. Loads not-to-exceed 80 percent of nameplate rating
- C. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.
- D. Wiring Terminations:
1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Coordinate conductor sizes with Division 26, Electrical. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
  2. For fractional horsepower motors where connection is made directly, provide conduit connection in end frame.
- E. Single Phase Power, Split Phase Motors:
1. Starting Torque: Less than 150 percent of full load torque.
  2. Starting Current: Up to seven times full load current.
  3. Breakdown Torque: Approximately 200 percent of full load torque.



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4. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, prelubricated sleeve or ball bearings.
  5. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings.
- F. Single Phase Power, Permanent-Split Capacitor Motors:
1. Starting Torque: Exceeding one fourth of full load torque.
  2. Starting Current: Up to six times full load current.
  3. Multiple Speed: Through tapped windings.
  4. Open Drip-proof or Enclosed Air Over Enclosure: Class A (50 degrees C temperature rise) insulation, minimum 1.0 Service Factor, prelubricated sleeve or ball bearings, automatic reset overload protector.
- G. Single Phase Power, Capacitor Start Motors:
1. Starting Torque: Three times full load torque.
  2. Starting Current: Less than five times full load current.
  3. Pull-up Torque: Up to 350 percent of full load torque.
  4. Breakdown Torque: Approximately 250 percent of full load torque.
  5. Motors: Capacitor in series with starting winding; provide capacitor-start/capacitor-run motors with two capacitors in parallel with run capacitor remaining in circuit at operating speeds.
  6. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, prelubricated sleeve bearings.
  7. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings.
- H. Three Phase Power, Squirrel Cage Motors:
1. Starting Torque: Between 1 and 1-1/2 times full load torque.
  2. Starting Current: Six times full load current.
  3. Power Output, Locked Rotor Torque, Breakdown or Pull Out Torque: NEMA Design B characteristics.
  4. Design, Construction, Testing, and Performance: Conform to NEMA MG 1 for Design B motors.



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5. Insulation System: NEMA Class B or better. Use class F insulation when motors are controlled by a VFD.
  6. Testing Procedure: In accordance with IEEE 112. Load test motors to determine free from electrical or mechanical defects in compliance with performance data.
  7. Motor Frames: NEMA Standard T-Frames of steel, aluminum, or cast iron with end brackets of cast iron or aluminum with steel inserts.
  8. Thermistor System (Motor Frame Sizes 254T and Larger): Three PTC thermistors imbedded in motor windings and epoxy encapsulated solid state control relay for wiring into motor starter.
  9. Bearings: Grease lubricated anti-friction ball bearings with housings equipped with plugged provision for relubrication, rated for minimum ABMA STD 9, L-10 life of 200,000 hours. Calculate bearing load with NEMA minimum V-belt pulley with belt center line at end of NEMA standard shaft extension. Stamp bearing sizes on nameplate.
  10. Sound Power Levels: To NEMA MG 1.
  11. Weatherproof Epoxy Treated Motors: Epoxy coat windings with rotor and starter surfaces protected with epoxy enamel; bearings double shielded with waterproof non-washing grease.
  12. Nominal Efficiency: Meet or exceed NEMA Premium Efficiency rating when tested in accordance with IEEE 112.
  13. Nominal Power Factor: Minimum at full load and rated voltage when tested in accordance with IEEE 112.
- I. Electronically Commutated Motors:
1. Brushless DC type motor specifically designed for intended application.
  2. Permanently lubricated motor with heavy duty ball bearing type to match intended application load.
  3. Operation Range: 20 percent to 100 percent of full speed (80 percent turndown).
  4. Motor Efficiency: Minimum 85 percent efficient at all speeds.
  5. Pre-wired to specific voltage and phase. Internal motor circuitry to convert AC power supplied to the fan to DC power.

**PART 3 - EXECUTION**

**3.1 GENERAL INSTALLATION**

- A. Coordinate location of disconnect and starter or motor controller. Combination starter/disconnects may be used in lieu of separate items.



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- B. Provide inverter ready motors per NEMA MG1-30 for variable speed drive or soft-start starter use. Provide shaft grounding for motors over 2 HP serving variable speed drives. Provide shaft grounding and insulated bearings on motors 25 HP and larger serving variable speed drives. Shielded cable required for power wiring from variable speed drive to motor connection.
- C. Unless otherwise indicated, motors 1-HP and larger to meet/exceed NEMA Premium Efficiency and latest EPACT.
- D. Vertical in-line pump motors per NEMA MG1 vertical motor requirements.
- E. Exception: Motors less than 250 watts, for intermittent service, motors furnished with equipment manufacturer's standard package equipment need not conform to these specifications.
- F. Motors located in exterior locations or wet air streams are to be of totally enclosed type.
- G. Disconnects: Provided by Division 26, Electrical unless specified otherwise.
- H. After completing equipment installation, inspect unit components. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.

**3.2 STARTER INSTALLATION**

- A. Install starters in accordance with manufacturer's instructions.
- B. Coordinate disconnect requirements and location with Division 26, Electrical if not integral to starter. If starter is installed out of line of sight of motor, provide additional disconnect at motor per code.
- C. Provide NEMA housing appropriate to installation location.
- D. Provide supports and install securely, in neat and workmanlike manner, as specified in NECA 1.
- E. Meet mounting height and accessible location requirements per local code.
- F. Provide fuses for fusible switches.
- G. Select and install overload heater elements in motor starters to match installed motor characteristics.
- H. Single Phase 120 Volt Starter: If not furnished as single packaged controller/disconnect, provide contactors, relays, wiring and devices necessary to match sequence of operation for equipment.

**3.3 SHAFT GROUNDING INSTALLATION**

- A. Shaft grounding assembly installation not to affect the motor manufacturer warranty. Where the severe environment conditions require application of the shaft grounding types that are screwed into the motor shaft, the installation of the shaft grounding system



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performed either by the motor manufacturer or by the motor manufacturer authorized facility.

- B. Bond the brush to the closest ground point using code sized green insulated stranded copper conductor per manufacturer instructions.
- C. Test and verify the performance of the assembly to ensure that under no conditions the shaft exceeds 3 volts.
- D. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.
- E. Check line voltage and phase and ensure agreement with nameplate.
- F. Verify motor rotation.

**3.4 MOTOR INSTALLATION**

- A. Electrical Service: Power wiring from source to motor termination under Division 26, Electrical.
- B. Install in accordance with manufacturer's instructions. Coordinate with starter or variable speed controller with control sequence to provide necessary starter accessories.
- C. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.
- D. Check line voltage and phase and ensure agreement with nameplate.
- E. Verify motor rotation.
- F. Field Quality Control:
  - 1. Prepare for acceptance tests as follows:
    - a. Run each motor with its controller. Demonstrate correct rotation, alignment, and speed at motor design load.
    - b. Test interlocks and control features for proper operation.
    - c. Verify that current in each phase is within nameplate rating.
  - 2. Testing: Perform the following field quality-control testing:
    - a. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.15.1. Certify compliance with test parameters.
    - b. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
  - 3. Manufacturer's Field Service: Engage a factory-authorized service representative to perform the following:





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- a. Inspect field-assembled components, equipment installation, and piping and electrical connections for compliance with requirements.
- b. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- c. Verify bearing lubrication.
- d. Verify proper motor rotation.
- e. Test Reports: Prepare a written report to record the following test procedures used:
  - 1) Test results that comply with requirements.
  - 2) Test results that do not comply with requirements and corrective action taken to achieve compliance.
- G. Align motors, bases, shafts, pulleys and belts. Tension belts according to manufacturer's written instructions.
- H. Clean motors, on completion of installation, according to manufacturer's written instructions.

**END OF SECTION**

**SECTION 23 05 29  
HANGERS AND SUPPORTS FOR HVAC PIPING, DUCTWORK AND EQUIPMENT**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Work Included:
  - 1. Hangers and Supports for HVAC Piping, Ductwork and Equipment
  - 2. Wall and Floor Sleeves
  - 3. Building Attachments
  - 4. Flashing
  - 5. Miscellaneous Metal and Materials

**1.2 RELATED SECTIONS**

- A. Contents of Division 23, HVAC and Division 01, General Requirements apply to this Section.

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.
- B. In addition, meet the following:
  - 1. ASCE 7-16, Minimum Design Loads for Buildings and Other Structures.
  - 2. Terminology: As defined in MSS SP-90 "Guidelines on Terminology for Pipe Hangers and Supports".
  - 3. Install ductwork and piping per SMACNA's requirements.
  - 4. Hanger spacing installation and attachment to meet all manufacturer's requirements and MSS SP-58.

**1.4 SUBMITTALS**

- A. Submittals as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

**1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.
- B. In addition, meet the following:



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1. Welding:
  - a. Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
2. Welding for Hangers:
  - a. Qualify procedures and personnel according to AWS D9.1, Sheet Metal Welding Code for duct joint and seam welding.
3. Engineering Responsibility:
  - a. Design and preparation of Shop Drawings and calculations for each multiple pipe support, trapeze, duct support, equipment hangers/supports, support from floor structure, roof structure or from structure above, and seismic restraint by a qualified Structural Professional Engineer.
    - 1) Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of hangers and supports that are similar to those indicated for this Project in material, design, and extent.
4. Manufacturers regularly engaged in the manufacture of bolted metal framing support systems, whose products have been in satisfactory use in similar service for not less than 10 years.
5. Support systems to be supplied by a single manufacturer.

**1.6 WARRANTY**

- A. Warranty of materials and workmanship as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

**1.7 PERFORMANCE REQUIREMENTS**

- A. Provide pipe, ductwork and equipment hangers and supports in accordance with the following:
  1. When supports, anchorages, and seismic restraints for equipment, and supports, anchorages, and seismic restraints for conduit, piping, and ductwork are not shown on the Drawings, the contractor is responsible for their design.
  2. Connections to structural framing not to introduce twisting, torsion, or lateral bending in the framing members. Provide supplementary steel as required.
- B. Provide seismic restraint hangers and supports for piping, ductwork and equipment. See Section 23 05 48, Vibration and Seismic Controls for HVAC Equipment.



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- C. Obtain approval from AHJ for seismic restraint hanger and support system to be installed for piping and equipment. See Section 23 05 48, Vibration and Seismic Controls for HVAC Equipment.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Hangers and Supports for HVAC Piping, Ductwork and Equipment:

- 1. Anvil International
- 2. B-Line Systems, Inc.
- 3. Erico Company, Inc.
- 4. Nelson-Olsen Inc.
- 5. Rilco Manufacturing Company, Inc.
- 6. Snappitz Thermal Pipe Shield Manufacturing
- 7. Unistrut Corporation

- B. Wall Sleeves:

- 1. Thunderline Corporation "Link Seal"
- 2. Or approved equivalent.

- C. Building Attachments:

- 1. Anchor-It
- 2. Gunnebo Fastening Corporation
- 3. Hilti Corporation
- 4. ITW Ramset/Red Head
- 5. Masterset Fastening Systems, Inc.

**2.2 HANGERS AND SUPPORTS FOR HVAC PIPING, DUCTWORK AND EQUIPMENT**

- A. Hanger Rods: Hanger rods continuously threaded or threaded ends only in concealed spaces and threaded ends only in exposed spaces; finish electro-galvanized or cadmium-plated in concealed spaces and prime painted in exposed spaces; sizes per MSS.
- B. Hanger Rod Couplings: Anvil Figure 136, B-Line Figure B3220, or approved equivalent; malleable iron rod coupling with elongated center sight gap for visual inspection; to have same finish as hanger rods.



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- C. Continuous Concrete Insert: Steel construction, minimum 12 gauge. Electrogalvanized finish. Pipe clamps and insert nuts to match.
- D. Pipe Hangers:
  - 1. Pipe Rings for Hanger Rods:
    - a. Pipe Sizes 2-inches and Smaller: Adjustable swivel ring hanger, UL listed. Erico 100 or 101, Anvil Figures 69 or 104, or approved equivalent.
    - b. Pipe Sizes 2-1/2-inches and Larger: Clevis type hangers with adjustable nuts on rod, UL listed. Anvil figure 260, Erico 400, or approved equivalent.
    - c. Pipe hangers to have same finish as hanger rods.
- E. Pipe Saddles and Shields:
  - 1. Factory fabricated saddles or shields under piping hangers and supports for insulated piping.
  - 2. Size saddles and shields for exact fit to mate with pipe insulation. 1/2 round, 18 gauge, minimum 12-inches in length (4-inch pipe and larger to be three times longer than pipe diameter).
- F. Pipe Slides: Anvil, reinforced Teflon slide material (3/32-inch minimum thickness) bonded to steel; highly finished steel or stainless steel contact surfaces to resist corrosion; 60-80 PSI maximum active contact surface loading; steel parts 3/16-inch minimum thickness; attachment to pipe and framing by welding.
- G. Pipe Roller Hangers: Adjustable roller hanger. Black steel yoke, cast iron roller. MSS Type 41.
- H. Thermal Hanger Shield Inserts:
  - 1. 100-PSI (690-kPa) minimum compressive strength calcium silicate insulation, encased in sheet metal shield or polyisocyanurate rigid foam exceeding the load bearing weight of the pipe at the hanger point with a PVC vapor barrier.
  - 2. Material for Cold Piping: Water-repellent-treated, ASTM C533, Type I calcium silicate with vapor barrier or polyisocyanurate rigid foam with a PVC vapor barrier.
  - 3. Material for Hot Piping: Water-repellent-treated ASTM C533, Type 1 calcium silicate or polyisocyanurate rigid foam with a PVC vapor barrier.
  - 4. For Trapeze or Clamped System: Insert and shield cover entire circumference of pipe.
  - 5. For Clevis or Band Hanger: Insert and shield cover lower 180 degrees of pipe.



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- 6. Insert Length: Extend 2-inches beyond sheet metal shield for piping operating below ambient air temperature.
- 7. Thermal Hanger Shield Insulation Operating Temperature: Meet or exceed fluid temperature in pipe.
- I. Freestanding Roof Supports: Polyethylene high-density UV resistant quick "pipe" block with foam pad.

**2.3 WALL SLEEVES**

- A. Pre-Engineered Firestop Pipe Penetration Systems: UL listed assemblies for maintaining fire rating of piping penetrations through fire-rated assemblies. Comply with ASTM E814.
- B. Fabricated Accessories:
  - 1. Steel Pipe Sleeves: Fabricate from Schedule 40 black or galvanized steel pipe. Remove end burrs by grinding.
  - 2. Sheet Metal Pipe Sleeves: Fabricate from G-90 galvanized sheets closed with lock-seam joints. Provide the following minimum gauges for the sizes indicated:
    - a. Sleeve Size 4-inches in Diameter and Smaller: 18 gauge.
    - b. Sleeve Sizes 5-6-inches: 16 gauge.
    - c. Sleeve Sizes 7-inches and Larger: 14 gauge.
    - d. Fire-Rated Safing Material.
      - 1) Rockwool Insulation: Complying with FS-HH-I-558, Form A, Class IV, 6 pounds per cubic foot density with melting point of 1985 degrees F and K value of 0.24 at 75 degrees F.
      - 2) Calcium Silicate Insulation: Noncombustible, complying with FS-HH-I-523, Type II, suitable for 100 degrees F to 1200 degrees F service with K value of 0.40 at 150 degrees F.

**2.4 BUILDING ATTACHMENTS**

- A. Beam Clamps:
  - 1. MSS Type 19 and 23, wide throat, with retaining clip.
  - 2. Universal Side Beam Clamp: MSS Type 20.
- B. Powder-Actuated Drive Pin Fasteners: Powder actuated type, drive pin attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.
- C. Anchor Bolts:



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1. Anchor supports to existing masonry, block and tile walls per anchoring system manufacturer's recommendations or as modified by project structural engineer. Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.
2. Anchor Bolts (Cast-In-Place): Steel bolts, ASTM A307. Nuts to conform to ASTM A194. Design values for shear and tension not more than 80 percent of the allowable listed loads.
3. Anchor (Expansion) Bolts: Carbon steel to ASTM A307; nut to conform to ASTM A194; drilled-in type. Design values for shear and tension not more than 80 percent of the allowable listed loads.
4. Anchor (Adhesive) Bolts: Consisting of two-part adhesive cartridge and zinc-plated Type A307 steel anchor bolt rod assembly with ASTM A194 nut.

**2.5 FLASHING**

- A. Steel Flashing: 26 gauge galvanized steel.
- B. Safes: 8 mil thick neoprene.
- C. Caps: Steel, 22 gauge minimum, 16 gauge at fire-resistant structures.

**2.6 MISCELLANEOUS METAL AND MATERIALS**

- A. General:
  1. Provide miscellaneous supports and metal items, including materials, fabrication, fastenings and accessories required for finished installation, where indicated on drawings or otherwise not shown on drawings that are necessary for completion of the project. Contractor is responsible for their design.
  2. Fabricate miscellaneous units to size shapes and profiles indicated or, if not indicated, of required dimensions to receive adjacent other work to be retained by framing. Except as otherwise shown, fabricate from structural steel shapes and plates and steel bars, of welded construction using mitered joints for field connection. Cut, drill and tap units to receive hardware and similar items.
- B. Structural Shapes: Where miscellaneous metal items are needed to be fabricated from structural steel shapes and plates, provide members constructed of steel conforming with requirements of ASTM A36 or approved equivalent.
- C. Steel Pipe: Provide seamless steel pipe conforming to requirements of ASTM A53, Type S, Grade A, or Grade B. Weight and size required as specified.
- D. Fasteners: Provide fasteners of types as required for assembly and installation of fabricated items; surface-applied fasteners are specified elsewhere.
- E. Bolts: Low carbon steel externally and internally threaded fasteners conforming with requirements of ASTM A307; include necessary nuts and plain hardened washers. For



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structural steel elements supporting mechanical material or equipment from building structural members or connection thereto, use fasteners conforming to ASTM A325.

- F. Miscellaneous Materials: Provide incidental accessory materials, tools, methods, and equipment required for fabrication.
- G. Provide hot dipped galvanized components for items exposed to weather. Cold galvanize field-welded joints and components. Use materials compatible with system being supported (i.e. aluminum for aluminum ductwork, stainless steel for stainless steel ductwork).
- H. Use straps, threshold rods and wire with sizes required by SMACNA to support ductwork.
- I. Grout:
  - 1. ASTM C1107, Grade B, factory mixed and packaged, nonshrink and nonmetallic, dry, hydraulic-cement grout.
  - 2. Characteristics: Post hardening and volume adjusting; recommended for both interior and exterior applications.
  - 3. Properties: Nonstaining, noncorrosive, and non gaseous.
  - 4. Design Mix: 5000-PSI (34.5-MPa), 28-day compressive strength.

**PART 3 - EXECUTION**

**3.1 GENERAL INSTALLATION REQUIREMENTS**

- A. Verify building materials to have hangers and attachments affixed in accordance with hangers to be used. Provide supporting calculations.
- B. Examine Drawings and coordinate for verification of exact locations of fire and smoke rated walls, partitions, floors and other assemblies. Indicate, by shading and labeling on Record Drawings such locations and label as "1-Hour Wall," "2-Hour Fire/Smoke Barrier," and the like. Determine proper locations for piping penetrations. Set sleeves in place in new floors, walls or roofs prior to concrete pour or grouting.
- C. Install hangers, supports, anchors and sleeves after required building structural work has been completed in areas where the work is to be installed. Coordinate proper placement of inserts, anchors and other building structural attachments.
- D. Equipment Clearances: Do not route ductwork, equipment, or piping through electrical rooms, transformer vaults, elevator equipment rooms, IT rooms, MPOE rooms, or other electrical or electronic equipment spaces and enclosures and the like. Within equipment rooms, provide minimum 3-foot lateral clearance from all sides of electric switchgear panels. Do not route ductwork, equipment, or piping above any electric power or lighting panel, switchgear, or similar electric device. Coordinate with Electrical and coordinate exact ductwork, equipment or pipe routing to provide proper clearance with such items.





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- A. Hang rectangular sheet-metal ducts with a cross sectional area of less than 7 SF with galvanized strips of No. 16 USS gauge steel 1-inch wide, and larger ducts with steel angles and adjustable hanger rods similar to piping hangers. Support at a maximum of 8-feet on center.
- B. Support horizontal ducts within 24-inches of each elbow and within 48-inches of each branch intersection.
- C. Design hangers and supports to allow for expansion and contraction.
- D. Support vertical ducts at maximum intervals of 16-feet and at each floor.
- E. Install upper attachments to structures with an allowable load not exceeding one-fourth of failure (proof-test) load.
- F. Install flexible ductwork per the more stringent of SMACNA HVAC Duct Construction Standards or the following:
  - 1. Support horizontal duct runs at not more than 4 feet intervals.
  - 2. Support vertical risers at not more than 6 feet intervals.
  - 3. Limit sag between support hangers to 1/2-inch per foot of spacing support.
  - 4. Supports shall be rigid and shall be not less than 1.5-inches wide at point of contact with the duct surface.
  - 5. Duct bends shall be not less than 1.5 duct diameter bend radius.
- G. Use double nuts and lock washers on threaded rod supports.
- H. Anchor ducts securely to building in such a manner as to prevent transmission of vibration to structure. Do not connect duct hanger straps directly to roof deck. Do not support ducts from other ducts, piping or equipment.
- I. Attach strap hangers installed flush with end of sheet-metal duct run to duct with sheet-metal screws.
- J. Construct exterior ductwork or ductwork which is otherwise exposed to weather watertight and slope 1/4-inch per foot to avoid standing water.
- K. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- L. 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.



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- M. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- N. Adjust hangers so as to distribute loads equally on attachments. Provide grout under supports to bring piping, ductwork and equipment to proper level and elevations.
- O. Prime paint ferrous nongalvanized hangers, accessories, and supplementary steel which are not factory painted.
- P. Horizontal Piping Hangers and Supports; Horizontal and Vertical Piping, and Hanger Rod Attachments:
  - 1. Factory fabricated horizontal piping hangers and supports complying with MSS SP-58, to suit piping systems and in accordance with manufacturer's published product information.
  - 2. Use only one type by one manufacturer for each piping service.
  - 3. Select size of hangers and supports to exactly fit pipe size for bare piping, and to exactly fit around piping insulation with saddle or shield for insulated piping.
  - 4. Pipe support spacing (pipe supported in ceiling or floor-supported) to meet latest applicable Code and manufacturer's requirements.
  - 5. Provide copper-plated hangers and supports for uninsulated copper piping systems.
- Q. Plumber's Tape not permitted as pipe hangers or pipe straps.
- R. Comply with MSS SP-58. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure. For horizontally hung grooved-end piping, provide a minimum of 2 hangers per pipe section.
- S. Pipe Ring Diameters:
  - 1. Uninsulated and Insulated Pipe, Except Where Oversized Pipe Rings are Specified: Ring inner diameter to suit pipe outer diameter.
  - 2. Insulated Piping Where Oversized Pipe Rings are Specified and Vibration Isolating Sleeves: Ring inner diameter to suit outer diameter of insulation or sleeve.
- T. Oversize Pipe Rings: Provide oversize pipe rings of 2-inch and larger size.
- U. Pipe Support Brackets: Support pipe with pipe slides.
- V. Steel Backing in Walls: Provide steel backing in walls to support fixtures and piping hung from steel stud walls.
- W. Do not support piping from other piping.



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- X. Fire protection piping will be supported independently of other piping.
- Y. Prevent electrolysis in support of copper tubing by use of hangers and supports which are copper plated.
- Z. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9, "Building Services Piping" is not exceeded.
- AA. Insulated Piping:
  - 1. Attach clamps and spacers to piping.
    - a. Piping Operating Above Ambient Air Temperature: Clamp may project through insulation.
    - b. Piping Operating Below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
  - 2. Do not exceed pipe stress limits according to ASME B31.9.
  - 3. Install MSS SP-58, Type 39 protection saddles, if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
  - 4. Install MSS SP-58, Type 40 protective shields on cold piping with vapor barrier. Shields to span arc of 180 degrees.
  - 5. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN100) and larger if pipe is installed on rollers.
  - 6. Shield Dimensions for Pipe, not less than the following:
    - a. NPS 1/4 to NPS 3-1/2 (DN8 to DN 90): 12-inches long and 0.048-inch thick.
    - b. NPS 4 (DN100): 12-inches long and 0.06-inch thick.
    - c. NPS 5 and NPS 6 (DN125 and DN150): 18-inches long and 0.06-inch thick.
    - d. NPS 8 to NPS 14 (DN200 to DN350): 24-inches long and 0.075-inch thick.
    - e. NPS 16 to NPS 24 (DN400 to DN600): 24-inches long and 0.105-inch thick.
  - 7. Pipes NPS 8 (DN200) and Larger: Include wood inserts.
    - a. Insert Material: Length at least as long as protective shield.



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- 8. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.
- BB. Pipe Anchors: Provide anchors to fasten piping which is subject to expansion and contraction, and adjacent to equipment to prevent loading high forces onto the equipment.
- CC. Pipe Curb Assemblies:
  - 1. Provide prefabricated units for roof membrane and insulation penetrations related to equipment. Coordinate with roofing system. Set supports on the structural deck. Do not set supports on insulation or roofing. Provide level supports by prefabricated pitch built into the curb.
  - 2. Provide for piping and electrical conduit which penetrates the structural roof deck to service equipment above the roof level (i.e., piping, electrical power and control wiring). Meet requirements of roof warranty.
- DD. Escutcheon Plates: Install around horizontal and vertical piping at visible penetrations through walls, partitions, floors, or ceilings, including penetrations through closets, through below ceiling corridor walls, and through equipment room walls and floors.
- EE. Vertical Piping:
  - 1. Support with U-clamps fastened to wall to hold piping away from wall unless otherwise approved.
  - 2. Riser clamps to be directly under fitting or welded to pipe.
    - a. Riser to be supported at each floor of penetration.
    - b. Provide structural steel supports at the base of pipe risers. Size supports to carry forces exerted by piping system when in operation.
- FF. Piping Above Roof:
  - 1. Provide engineered roof piping supports appropriate for installation and attachment to the roof structure or structure below roof (see Architectural and Structural Drawings for roof construction, building structural systems, and sloping requirements for insulation).
  - 2. Design a complete system unless specific details have been shown on Drawings.
  - 3. Provide calculations signed and stamped by a Structural Engineer, registered in the State where the project is located at, as part of submittals and coordinated shop drawings.
  - 4. Do not use freestanding supports unless approved by the Structural Engineer of Record.



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5. Provide miscellaneous metal and materials as specified in Miscellaneous Metal and Materials article, above.

**3.3 WALL SLEEVES**

**A. Fabricated Pipe Sleeves:**

1. Provide either steel or sheet metal pipe sleeves accurately centered around pipe routes. Size such that piping and insulation, if any, will have free movement within the sleeve, including allowance for thermal expansion. Sleeve diameter to be determined by local seismic clearance requirements, and by waterproofing requirements.
2. Length: Equal to thickness of construction penetrated, except extend floor sleeves 1-inch above floor finish.
3. Provide temporary support of sleeves during placement in concrete and other work around sleeves. Provide temporary end closures to prevent concrete and other materials from entering pipe sleeves.
4. Seal each end airtight with a resilient nonhardening sealer, UL listed, fire rated ASTM 814.

**B. Installation of metallic or plastic piping penetrations through non fire-rated walls and partitions and through smoke-rated walls and partitions:**

1. Install fabricated pipe sleeve.
2. After installation of sleeve and piping, tightly pack entire annular void between piping or piping insulation and sleeve identification with specified material.
3. Seal each end airtight with a resilient nonhardening UL listed fire resistant ASTM 814.

**C. Piping Penetrations Through Fire-Rated (One to Three Hour) Assemblies:**

1. Select and install pre-engineered pipe penetration system in accordance with the UL listing and manufacturer's recommendation.
2. Provide proper sizing when providing sleeves or core-drilled holes to accommodate the penetration. Firestop voids between sleeve or core-drilled hole and pipe passing through to meet the requirements of ASTM E814.

**3.4 BUILDING ATTACHMENTS**

- A. Factory fabricated attachments complying with MSS SP-58, selected to suit building substructure conditions and in accordance manufacturer's published product information.
- B. Select size of building attachments to suit hanger rods.
- C. Space attachments within maximum piping span length indicated in MSS SP-58.



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- D. Install building attachments within concrete slabs or attach to structural steel or wood. Install additional building attachments where support is required for additional concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping.
- E. Attachment to Wood Structure: Anvil side beam bracket Figure 202 for attachment to wooden beam or approved attachment for a wood structure.
- F. Install mechanical-anchor fasteners in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- G. Install concrete inserts before concrete is placed; fasten inserts to forms. Where concrete with compressive strength less than 2500 PSI is indicated, install reinforcing bars through openings at top in inserts.
- H. Install powder-actuated drive-pin fasteners in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual. Test powder-actuated insert attachments with a minimum load of 100 pounds.
- I. Do not use powder-actuated concrete fasteners for lightweight aggregate concretes or for slabs less than 4-inches thick.
- J. Bolting: Provide bored, drilled or reamed holes for bolting to miscellaneous structural metals, frames or for mounts or supports. Flame cut, punched or hand sawn holes will not be accepted.
- K. Anchor Bolts:
  - 1. Install anchor bolts for mechanical equipment, piping and ductwork as required. Tightly fit and clamp base-supported equipment anchor bolts at equipment support points. Provide locknuts where equipment, piping and ductwork are hung.
  - 2. Anchor Bolts (Cast-In-Place): Embed anchor bolts in new cast-in-place concrete to anchor equipment. Install a pipe sleeve around the anchor bolt for adjustment of the top 1/3 of the bolt embedment; sizes and patterns to suit the installation conditions of the equipment to be anchored.

**3.5 FLASHING**

- A. Flash and counterflash where piping, ductwork and equipment passes through weather or waterproofed walls, floors, and roofs.
- B. Provide 12-inch minimum height curbs for roof-mounted mechanical equipment. Flash and counter flash with galvanized steel, soldered and waterproofed.

**3.6 MISCELLANEOUS METAL AND MATERIALS**

- A. General: Verify dimensions prior to fabrication. Form metal items to accurate sizes and configurations as indicated on drawings and otherwise required for proper installation;



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make with lines straight and angles sharp, clean and true; drill, countersink, tap, and otherwise prepare items for connections with work of other trades, as required. Fabricate to detail of structural shapes, plates and bars; weld joints where practicable; provide bolts and other connection devices required. Include anchorages; clip angles, sleeves, anchor plates, and similar devices. Hot dipped galvanize after fabrication items installed in exterior locations. Set accurately in position as required and anchor securely to building construction. Construct items with joints formed for strength and rigidity, accurately machining for proper fit; where exposed to weather, form to exclude water.

**B. Finishes:**

1. Ferrous Metal: After fabrication, but before erection, clean surfaces by mechanical or chemical methods to remove rust, scale, oil, corrosion, or other substances detrimental to bonding of subsequently applied protective coatings. For metal items exposed to weather or moisture, galvanize in manner to obtain G90 zinc coating in accordance with ASTM A123. Provide other non-galvanized ferrous metal with 1 coat of approved rust-resisting paint primer, in manner to obtain not less than 1.0 mil dry film thickness. Touch-up damaged areas in primer with same material, before installation. Apply zinc coatings and paint primers uniformly and smoothly; leave ready for finish painting as specified elsewhere.
2. Metal in Contact with Concrete, Masonry and Other Dissimilar Materials: Where metal items are to be erected in contact with dissimilar materials, provide contact surfaces with coating of an approved zinc-chromate primer in manner to obtain not less than 1.0 mil dry film thickness, in addition to other coatings specified in these specifications.
3. For Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and apply galvanizing repair paint to comply with ASTM A780.

- C. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as concrete inserts, sleeves, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; including, threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws and other connectors as required. Avoid cutting concrete reinforcing when drilling for inserts. Reference structural drawings and reinforcing shop drawings and determine locations of stirrups prior to drilling into concrete.
- E. Cutting, Fitting and Placement: Perform cutting, drilling and fitting required for installation of miscellaneous metal fabrications. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items, which are to be built into concrete masonry or similar construction.



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- F. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, and methods used in correcting welding work.
- G. Setting Loose Plates: Clean concrete and masonry bearing surfaces of any bond reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.
- H. Set loose leveling and bearing plates on wedges, or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut-off flush with edge of the bearing plate before packing with grout. Use metallic non-shrink grout in concealed locations where not exposed to moisture; use non-metallic non-shrink grout in exposed locations, unless otherwise indicated.
- I. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.
- J. Cut, drill, and fit miscellaneous metal fabrications for heavy-duty steel trapezes and equipment supports.
- K. Fit exposed connections together to form hairline joints. Field-weld connections that cannot be shop-welded because of shipping size limitations.
- L. 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.
- M. Provide galvanized components for items exposed to weather.

**3.7 FIRE RATED SUPPORTS**

- A. Provide fire-rated support as required by Codes.

**END OF SECTION**



**SECTION 23 05 48**  
**VIBRATION AND SEISMIC CONTROLS FOR HVAC EQUIPMENT**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Work Included:
  - 1. Seismic Restraint Devices
  - 2. Factory Finishes
  - 3. Seismic-Bracing/Restraint Devices/Systems for Equipment, Piping and Ductwork
- B. General:
  - 1. Vibration isolation for mechanical ductwork, piping and equipment.
  - 2. Seismic restraint for mechanical ductwork, piping and equipment.
  - 3. Seismic Certification for equipment, hangers and systems.
  - 4. Special inspections for systems.
- C. Scope of Work:
  - 1. Vibration isolation and seismic restraint of new equipment and systems within project boundary defined in architectural drawings.
  - 2. Vibration isolation and seismic restraint of new equipment and systems in existing buildings to points of connection with existing systems.
  - 3. Seismic restraint of existing systems and equipment shown on Drawings, within project boundary defined in architectural drawings.
  - 4. Provide supplementary structural steel for seismic restraint systems. No hanging from roof deck is permitted on this project, unless specifically allowed by Structural Engineer of Record in writing prior to bid.

**1.2 RELATED SECTIONS**

- A. Contents of Division 23, HVAC and Division 01, General Requirements apply to this Section.

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.



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**1.4 SUBMITTALS**

- A. Submittals as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.
- B. In addition, provide:
  - 1. Vibration Isolation:
    - a. Product Data: Provide catalog data indicating size, type, load and deflection of each isolator; and percent of vibration transmitted based on lowest disturbing frequency of equipment.
    - b. Shop Drawings: Showing complete details of construction for steel and concrete bases including:
      - 1) Fabrication, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, base weights, equipment static loads, power transmission, component misalignment and cantilever loads.
      - 2) Equipment mounting holes.
      - 3) Dimensions.
      - 4) Size and location of concrete and steel bases and curbs.
      - 5) Isolation selected for each support point.
      - 6) Details of mounting brackets for isolator.
      - 7) Weight distribution for each isolator.
      - 8) Details of seismic snubbers.
      - 9) Code number assigned to each isolator.
    - c. Design calculations: Provide calculations for selecting vibration isolators and for designing vibration isolation bases.
  - 2. Seismic Restraint:
    - a. Shop Drawings: Show compliance with requirements of Quality Assurance article of this Section. Shop drawings to be stamped by a professional Structural Engineer licensed in State of California.
    - b. Calculations: Submit seismic calculations indicating restraint loadings resulting from design seismic forces. Include anchorage details and indicate quantity, diameter and depth of penetration of anchors. Calculations certified by professional Structural Engineer licensed in State of California.



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3. Seismic Restraint Details: Detail fabrication and attachment of seismic restraints and snubbers. Show anchorage details and indicate quantity, diameter and depth of penetration of anchors.
4. Submittals for Interlocking Snubbers: Include load deflection curves up to 1/2-inch deflection in x, y and z planes.
5. Welding certificates.
6. Equipment Certification: Provide seismic certification for equipment as noted in Seismic Design Summary or schedules on Drawings.

**1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.
- B. In addition, meet the following:
  1. Seismic Restraint:
    - a. Code and Standard Requirements:
      - 1) Seismic restraint of equipment, piping and ductwork to be in accordance with latest enacted version of ASCE 7-16.
    - b. Confirm Seismic Control requirements in Division 01, General Requirements and Structural documents.
    - c. Seismic Design Category: E.
    - d. Building Occupancy Category: II.
    - e. Certification: See Seismic Design Table or schedules on Drawings for equipment, systems and seismic-restraint devices designated to have seismic certification/qualification. Horizontal and vertical load testing and analysis performed according to ASCE 7-16. Anchorage systems to bear anchorage preapproval number from an agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing or calculations, if preapproved ratings are not available. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be sealed by qualified licensed professional engineer in State of California. Testing and calculations must include both shear and tensile loads and one test or analysis at 45 degrees to weakest mode.
    - f. Seismic restraint and anchorage of permanent equipment and associated systems listed below to building structure be designed to resist total design seismic force prescribed in local building code:
      - 1) Floor- or roof-mounted equipment weighing 400 pounds or greater.



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- 2) Suspended, wall-mounted or vibration isolated equipment weighing 20 pounds or greater.
  - 3) In-line duct devices connected to ductwork weighing 75 pounds or greater.
  - 4) Housekeeping slabs: provide reinforcement and anchorage to building structure.
- g. Where required, seismic sway bracing of suspended duct and piping meet following:
- 1) Pipe and duct runs requiring seismic bracing have minimum of two traverse braces and one longitudinal brace. Longitudinal (or traverse) brace at 90 degree change in direction may act as traverse (or longitudinal) brace if located within 2-feet of change in direction.
  - 2) Seismic bracing may not pass through seismic separation joint. Pipe or duct runs that pass through seismic separation joint must be restrained within 5-feet of both sides of separation.
  - 3) Seismic brace assembly spacing not to exceed 40-feet transverse and 80-feet longitudinal.
- h. Seismic restraints may be omitted from suspended piping and duct if following conditions are satisfied:
- 1) For piping or ducts supported by rod hangers 12-inches or less in length from top of duct to bottom of structural support. Top connections to structure have swivel joints, eye bolts, or vibration isolation hangers for entire length of system run.
  - 2) Lateral motion of system will not cause damaging impact with surrounding systems or cause loss of system vertical support.
  - 3) System must be welded steel pipe, brazed copper pipe, sheet metal duct or similar ductile material with ductile connections.
- C. Seismic restraints, including anchors to building structure, be designed by registered professional Structural Engineer licensed in State of California. Design includes:
- 1. Number, size, capacity and location of anchors for floor- or roof-mounted equipment. For curb-mounted equipment, provide design of attachment of both unit to curb and curb to structure.
  - 2. Number, size, capacity and location of seismic restraint devices and anchors for vibration-isolation and suspended equipment. Provide calculations and test data verifying horizontal and vertical ratings of seismic restraint devices.
  - 3. Number, size, capacity and location of braces and anchors for suspended piping and ductwork on as-built plan drawings.



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4. Maximum seismic loads to be indicated on drawings at each brace location. Drawings bear stamp and signature of registered professional Structural Engineer who designed layout of braces.

**1.6 WARRANTY**

- A. Warranty of materials and workmanship as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

**1.7 EXTRA MATERIALS**

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
- B. Seismic Snubber Units: Furnish replacement neoprene inserts for snubbers.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Seismic Restraint Devices:
  1. The VMC Group
  2. B-Line Systems, Inc.
  3. Kinetics Noise Control, Inc.
  4. Mason Industries, Inc.
  5. M.W. Saussé - Vibrex
  6. California Dynamics Corporation
  7. Cooper B-Line Tolco
  8. Unistrut Diversified Products Co.; Wayne Manufacturing Division.
  9. Hilti, Inc.
- B. Factory Finishes:
  1. Kynar 500 Fluoropolymer Coating
  2. Or approved equivalent.
- C. Seismic-Bracing/Restraint Devices/Systems for Equipment, Piping and Ductwork:
  1. The VMC Group
  2. Kinetics Noise Control, Inc.



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3. Mason Industries, Inc.
4. Hilti, Inc.
5. Cooper B-Line, Inc.
6. California Dynamics Corporation
7. Unistrut
8. ISAT, Inc.
9. Where Mason numbers are specified, equivalent products by listed manufacturers are acceptable.

**2.2 SEISMIC RESTRAINT DEVICES**

- A. Resilient Isolation Washers and Bushings: 1-piece, molded, bridge-bearing neoprene complying with AASHTO M 251 and having a durometer of 50, plus or minus 5, with a flat washer face.
- B. Seismic Snubbers: Factory fabricated using welded structural-steel shapes and plates, anchor bolts and replaceable resilient isolation washers and bushings. Snubber load rating to match equipment size. Mason Type: Z-1011 or Z-1225.
  1. Anchor bolts for attaching to concrete be seismic-rated, drill-in and stud-wedge or female-wedge type.
  2. Resilient Isolation Washers and Bushings: 1-piece, molded, bridge-bearing neoprene complying with AASHTO M 251 and having a durometer of 50, plus or minus 5.
- C. Restraining Cables: Galvanized steel aircraft cables with end connections made of steel assemblies that swivel to final installation angle and utilize two clamping bolts for cable engagement. Mason Type: SCB.
- D. Anchor Bolts: Seismic-rated, drill-in and stud-wedge or female-wedge type. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488/E 488M.

**2.3 FACTORY FINISHES**

- A. Provide manufacturer's standard prime-coat finish ready for field painting. Units mounted outdoors exposed to weather: Epoxy powder coated, with 1000 hour salt spray rating per ASTM B-117. For high levels of corrosion protection utilize:
  1. Conform to AAMA 605.2.
  2. Apply coating following cleaning and pretreatment.
  3. Cleaning: AA-C12C42R1X.
  4. Dry system before final finish application.



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5. Total Dry Film Thickness: Approximately 1.2 mils, when baked at 450 degrees F for 10 minutes.
- B. Finish:
1. Manufacturer's standard paint applied to factory-assembled and factory-tested equipment before shipping.
  2. Powder coating on springs and housings.
  3. Hardware be electrogalvanized. Hot-dip galvanize metal components for exterior use.
  4. Baked enamel for metal components on isolators for interior use.
  5. Color-code or otherwise mark vibration isolation and seismic-control devices to indicate capacity range.

**2.4 SEISMIC-BRACING/RESTRAINT DEVICES/SYSTEMS FOR EQUIPMENT, PIPING AND DUCTWORK**

- A. General Requirements for Restraint Components: Rated strengths, features and applications to be as defined in reports by agency acceptable to authorities having jurisdiction.
- B. Structural Safety Factor: Allowable strength in tension, shear and pullout force of components be at least four times maximum seismic forces to which they will be subjected.
- C. Anchor bolts for attaching to concrete to be seismic-rated, drill-in and stud-wedge or female-wedge type.
- D. Resilient Isolation Washers and Bushings: Oil- and water-resistant neoprene.
- E. Maximum 1/4-inch air gap and minimum 1/4-inch thick resilient cushion.

**PART 3 - EXECUTION**

**3.1 GENERAL INSTALLATION REQUIREMENTS**

- A. Provide mounts for equipment installed outdoors for wind loads of 30 lbs. psf applied to any exposed surface of isolated equipment.
- B. Do not install equipment or pipe which makes rigid contact with building slabs, beams, studs, walls, etc.
- C. Anchor baseplate to floor or structure. Provide rubber grommets and washers to isolate bolt from base plate. Under no circumstances is isolation efficiency to be destroyed when bolting isolators to floor.
- D. Building Penetrations: Isolate water piping and ductwork penetrating wall, ceilings, floors or shafts from structure by piping isolator or by 3/8-inch thick foamed rubber insulation. Install units flush with finished structure face, using one for each side as required. Cut



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units to length if longer than structure thickness. Caulk around pipe or duct at equipment room wall.

- E. Provide roof curbs, equipment supports and roof penetrations. Work to maintain roof warranty. Coordinate location, size, structural connections/requirements and flashing prior to installation.
- F. Vibration isolators must not cause change of position of equipment or piping which would stress piping connections or misalignment shafts or bearings. Isolated equipment is to be level and in proper alignment with connecting ducts and pipes.
- G. Examination:
  - 1. Examine areas and equipment to receive vibration isolation and seismic-control devices for compliance with requirements, installation tolerances and other conditions affecting performance.
  - 2. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.
  - 3. Proceed with installation only after unsatisfactory conditions have been corrected.
- H. Testing: Perform following field quality-control testing:
  - 1. Isolator seismic-restraint clearance.
  - 2. Isolator deflection.
  - 3. Snubber minimum clearances.
- I. Adjusting:
  - 1. Adjust snubbers according to manufacturer's written recommendations.
  - 2. Torque anchor bolts according to equipment manufacturer's written recommendations to resist seismic forces.
- J. Cleaning: After completing equipment installation, inspect vibration isolation and seismic-control devices. Remove paint splatters and other spots, dirt and debris.
- K. Demonstration: Engage factory-authorized service representative to train Owner's maintenance personnel to adjust, operate and maintain air-mounting systems. Reference Division 01, General Requirements.

**3.2 VIBRATION ISOLATION**

- A. Reference General Installation Requirements above.
- B. Install per manufacturer's instructions and recommendations.
- C. Vibration isolators must be installed in strict accordance with manufacturer's written instructions and certified submittal data.





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D. Install isolation as indicated on Drawings by type and location and where indicated below.

E. Equipment Vibration Isolation Schedule:

Equipment	Size	Vibration Isolator Type	Minimum Deflection (in)
Fan-Coils, Unit Heaters, Fan-Powered Terminal Units	All	Type 5B, or 5C, FC-1,2	0.75
Condensing Units	0 to 4.5 tons	Type 1 or 2	0.3
Rooftop Air Handlers, AC, Heat Pump Units	20+ tons	RC-2, FC-1,2	1.5

F. Isolation Mounts:

1. Install minimum of four seismic snubbers on isolated equipment. Locate snubbers as close as possible to vibration isolators and bolt to equipment base and supporting structure.
2. Install resilient bolt isolation washers on equipment anchor bolts.
3. Provide flexible piping connection and flexible ductwork connection to equipment with isolation mounts or bases.

G. Isolating Hangers:

1. Support piping and ductwork connected to isolated equipment within equipment rooms on isolating hangers as scheduled on drawings. Unless otherwise noted, first three hangers from isolated equipment to have a minimum of 1/2 static deflection of equipment isolators. Other isolating hangers to have a minimum of 1/4 static deflection of equipment isolators.
2. Position isolating hanger elements as high as possible in hanger rod assembly, but not in contact with building structure. Install hangers so that hanger housing may rotate full 360 degrees about rod axis without contacting any object.
3. Unless otherwise noted, air supply units with internally isolated fans do not require isolating hangers for connecting pipes and ductwork.
4. Where parallel running pipes are hung together on an isolated trapeze, provide isolator deflections for largest determined by provisions for pipe isolation. Do not mix isolated and non-isolated pipes in same trapeze.
5. Install limit stops so they are out of contact during normal operation.

H. Adjusting:

1. Adjust isolators after piping systems have been filled and equipment is at operating weight.



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2. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.
3. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch movement during start and stop.

**3.3 SEISMIC RESTRAINT DEVICES**

- A. Reference General Installation Requirements above.
- B. Install in strict accordance with manufacturer's written instructions and certified submittal data.
- C. Install and adjust seismic restraints so equipment, piping and ductwork supports are not degraded by restraints.
- D. Restraints must not short circuit vibration isolation systems or transmit objectionable vibration or noise.
- E. Install restraining cables at each trapeze, individual pipe hanger and hanging vibration isolated equipment. Provide restraining cables in each of the four directions of movement. Install restraining cables no less than 45 degrees from vertical. At trapeze anchor locations, shackle piping to trapeze. Install cables so they do not bend across sharp edges of adjacent equipment or building structure.
- F. Install steel angles or channel, sized to prevent buckling, clamped with ductile-iron clamps to hanger rods for trapeze and individual pipe hangers. At trapeze anchor locations, shackle piping to trapeze. Requirements apply equally to hanging equipment. Do not weld angles to rods.

**3.4 FACTORY FINISHES**

- A. Reference General Installation Requirements above.
- B. Install per manufacturer's instructions and recommendations.
- C. Finishes to be factory-applied. No field patching or holidays allowed.

**3.5 SEISMIC-BRACING/RESTRAINT DEVICES/SYSTEMS FOR EQUIPMENT, PIPING AND DUCTWORK**

- A. Reference General Installation Requirements above.
- B. Install per manufacturer's instructions and recommendations.
- C. Adjust seismic restraints to permit free movement of equipment within normal mode of operation.

**END OF SECTION**

**SECTION 23 05 53**  
**IDENTIFICATION FOR HVAC PIPING, DUCTWORK AND EQUIPMENT**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Work Included:
  - 1. Plastic Nameplates
  - 2. Plastic Pipe Markers
  - 3. Ceiling Tags

**1.2 RELATED SECTIONS**

- A. Contents of Division 23, HVAC and Division 01, General Requirements apply to this Section.

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

**1.4 SUBMITTALS**

- A. Submittals as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.
- B. In addition, provide:
  - 1. Schedules:
    - a. Submit valve schedule for each piping system, in tabular format using Microsoft Word or Excel software. Tabulate valve number, piping system, system abbreviation (as shown on tag), location of valve (room or space), and variations for identification (if any). Mark valves which are intended for emergency shutoff and similar special uses by special "flags" in margin of schedule. In addition to mounted copies, furnish extra copies for maintenance manuals.
  - 2. Submit schedule of identification type, including material, for each class of tagged item.
  - 3. Submit locations at which Valve Schedules will be installed.

**1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.
- B. In addition, meet the following:



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1. Manufacturer's Qualifications: Firms regularly engaged in manufacture of identification devices of types and sizes required.
2. Codes and Standards: Comply with ANSI A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices unless otherwise indicated.

**1.6 WARRANTY**

- A. Warranty of materials and workmanship as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

**PART 2 - PRODUCTS**

**2.1 PLASTIC NAMEPLATES**

- A. Manufacturers:
  1. Brady Corporation
  2. Brimar
  3. Champion America
  4. Craftmark
  5. Seton
- B. Description: Engraving stock melamine plastic laminate in the size and thicknesses indicated, engraved with engraver's standard letter style of the sizes and wording indicated, black with white core (letter color), punched for mechanical fastening except where adhesive mounting is necessary because of substrate. Provide 1/8-inch thick material.
  1. Letter Color: White.
  2. Letter Height: 1/2-inch.
  3. Background Color: Black.
  4. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate the substrate.
  5. Access Panel Markers: Manufacturer's standard 1/16-inch thick engraved plastic laminate access panel markers, with abbreviations and numbers corresponding to concealed valve or devices/equipment. Include center hole to allow attachment.

**2.2 PLASTIC PIPE MARKERS**

- A. Manufacturers:



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1. Brady Corporation
  2. Brimar
  3. Champion America
  4. Craftmark
  5. Seton
- B. Color: Conform to ASME A13.1 and ANSI Z535.1.
- C. Plastic Pipe Markers (for external diameters of 6-inches and larger including insulation): Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. Minimum information indicating flow direction arrow and identification of fluid being conveyed.
- D. Plastic Tape Pipe Markers (for external diameters less than 6-inches including insulation): Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings. Minimum information indicating flow direction arrow and identification of fluid being conveyed.
- E. Lettering:
1. 3/4-inch to 1-1/4-inch Outside Diameter of Insulation or Pipe: 8-inch long color field, 1/2-inch high letters.
  2. 1-1/2-inch to 2-inch Outside Diameter of Insulation or Pipe: 8-inch long color field, 3/4-inch high letters.
  3. 2-1/2-inch to 6-inch Outside Diameter of Insulation or Pipe: 12-inch long color field, 1-1/4-inch high letters.
  4. 8-inch to 10-inch Outside Diameter of Insulation or Pipe: 24-inch long color field, 2-1/2-inch high letters.
  5. Over 10-inch Outside Diameter of Insulation or Pipe: 32-inch long color field, 3-1/2-inch high letters.

**2.3 CEILING TAGS**

- A. Manufacturers:
1. Brady Corporation
  2. Brimar
  3. Champion America
  4. Craftmark



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- 5. Seton
- B. Description: Steel with 3/4-inch diameter color coded head.
- C. Color code as follows:
  - 1. Yellow - HVAC equipment.
  - 2. Red - Fire dampers/smoke dampers.
  - 3. Blue - Heating/cooling valves.
  - 4. Ceiling tile labels, machine generated, adhesive backed tape labels with black letters, clear tape.

**PART 3 - EXECUTION**

**3.1 GENERAL INSTALLATION**

- A. Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates riveted to equipment body.
- B. Identify piping, concealed or exposed, with plastic pipe markers.
- C. Coordinate names, abbreviations and other designations used in mechanical identification work with corresponding designations shown, specified or scheduled. Provide numbers, lettering and wording as indicated or, if not otherwise indicated, as recommended by manufacturers or as required for proper identification and operation/maintenance of mechanical systems and equipment.
- D. Multiple Systems: Where multiple systems of same generic name are shown and specified, provide identification which indicates individual system number as well as service (as examples: Chiller No. 3, Air Handling Unit No. 42, Standpipe F12, and the like).
- E. Degrease and clean surfaces to receive adhesive for identification materials.
- F. Coordination: Where identification is to be applied to surfaces which require insulation, painting or other covering or finish, including valve tags in finished mechanical spaces, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.
- G. Coordinate with the facility maintenance personnel to ensure consistency with the existing tagging system.
- H. Install all products in accordance with manufacturer's instructions.
- I. Manual Balancing Dampers: Provide 12-inch long orange marker ribbon to end of balancing damper handle.



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**3.2 PLASTIC NAMEPLATES**

- A. Install plastic nameplates with corrosive-resistant mechanical fasteners.
- B. Identify control panels and major control components outside panels with plastic nameplates riveted to equipment body.
- C. Identify thermostats with nameplates.

**3.3 PLASTIC PIPE MARKERS**

- A. Install plastic pipe markers complete around pipe in accordance with manufacturer's instructions.
- B. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20-feet (reduced to 10-feet in congested areas and mechanical equipment rooms) on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction. Locate near branches, valves, control devices, equipment connections, access doors, floor/wall penetrations.

**3.4 CEILING TAGS**

- A. Provide ceiling tags to locate valves, dampers, and equipment above accessible ceilings. Locate in corner of ceiling tee grid closest to equipment.

**END OF SECTION**

**SECTION 23 05 93  
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**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Work Included:
  - 1. General Requirements and Procedures
  - 2. Ductwork Pressure Testing
  - 3. Fundamental Air Systems Balancing Procedures
  - 4. Temperature Control Verification
  - 5. Constant Volume Air Systems Balancing Procedures
  - 6. Variable Air Volume Systems Additional Procedures
  - 7. Series Fan Powered Terminal Unit Additional Procedures
  - 8. Pre-Balance Reporting
  - 9. Final Reports:
    - a. Report Requirements
    - b. General Report Data
    - c. System Diagrams
    - d. Air Handling Units
    - e. Fans
    - f. Duct Traverses
    - g. Diffusers/Registers/Grilles
    - h. Instrument Calibration
  - 10. Additional Tests

**1.2 RELATED SECTIONS**

- A. Contents of Division 23, HVAC and Division 01, General Requirements apply to this Section.





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**1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

**1.4 SUBMITTALS**

- A. Submittals as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.
- B. In addition, provide:
  - 1. Quality-Assurance Submittals: Submit two copies of evidence that the Testing, Adjusting, and Balancing (TAB) Agent and Project's TAB team members meet the qualifications specified in the "Quality Assurance" Article below.
  - 2. Pre-Construction Phase Report:
    - a. Provide a pre-construction phase TAB Plan at least two weeks prior to the commencement of TAB work. This report is to include:
      - 1) A complete set of report forms intended for use on the Project, with data filled in except for the field readings. Forms to be Project-specific.
      - 2) Marked up shop drawings identifying all HVAC equipment to be balanced, and associated outlets and terminal devices.
      - 3) Identification of the type, manufacturer, and model of the actual instruments to be used, and clear indication of which instrument will be used to take each type of reading. Calibration certifications to be included.
      - 4) A narrative of Project-specific and/or non-standard TAB procedures to be used, and the equipment or systems to which they apply.
  - 3. Contract Documents Examination Report: Within 45 days from the Contractor's Notice to Proceed, submit two copies of the Contract Documents review report as specified in Part 3 of this Section.
  - 4. Strategies and Procedures Plan: Submit two copies of the TAB strategies and step-by-step procedures as specified in Part 3 of this Section. Include a complete set of report forms intended for use on this Project.
  - 5. Specify reports required because of editing procedures in Part 3 of this Section.
  - 6. Certified TAB Reports: Submit two copies of reports prepared, as specified in this Section, on approved forms certified by the TAB Agent.
  - 7. Sample Report Forms: Submit two sets of sample TAB report forms.



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8. Test Instrument Calibration: Submit proof of calibration within the last 6 months.
9. Final Report.
10. Provide additional submittals to commissioning authority as dictated in Commissioning Specifications.

**1.5 QUALITY ASSURANCE**

- A. Quality Assurance as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.
- B. In addition, meet the following:
  1. Balance Firm Qualifications:
    - a. General:
      - 1) Procure services of independent TAB agency to balance, adjust and test water circulating and air moving equipment and air distribution or exhaust systems. Minimum experience: 5 years.
      - 2) Provide proof of testing agency having successfully completed at least five projects of similar size and scope.
    - b. Testing and Balancing firm is certified by NEBB or AABC and has a NEBB Certified Professional (CP) or a AABC Test and Balancer Engineer (TBE) on staff.
    - c. Industry Standards: Testing and Balancing will conform to NEBB or AABC, and American National Standards Institute (ANSI) as follows:
      - 1) NEBB: Comply with Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.
      - 2) AABC: Comply with National Standards for Total System Balance.
      - 3) ANSI:
        - (a) S1.4 Specifications for sound level meters.
        - (b) S1.11 Specifications for Octave-Band and Fractional-Octave-Band analog and digital filters.
        - (c) ANSI S1.13 Methods for the Measurement of Sound Pressure Levels.
    - d. Test Observation: If requested, conduct tests in the presence of the Commissioning Authority, AHJ, Architect or the Architect's representative.



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2. Noise Criteria:

- a. Noise levels in all 8 octave bands due to equipment and duct systems are not to exceed the following NC levels:

TYPE OF ROOM	NC LEVEL
Bathrooms and Toilet Rooms	35-40
Conference Room	30-35
Corridors (Public)	35-40
Lobbies, Waiting Areas	35-40
Offices, Large Open (3 or more occupants)	35-40
Offices, Small Private (2 or fewer occupants)	30-35
Kitchens	40-45
Classrooms (Small, Medium, Large)	30-35
Cafeteria/Dining	35-40
All Others	35-40

- b. An allowance, not to exceed 5db, may be added to the measured value to compensate for the variation of the room attenuating effect between room test condition prior to occupancy and design condition after occupancy which may include the addition of sound absorbing material, such as furniture. This allowance may not be taken after occupancy. The room attenuating effect is defined as the difference between sound power level emitted to room and sound pressure level in room.
- c. In absence of specified measurement requirements, measure equipment noise levels three feet from equipment and at an elevation of maximum noise generation.

3. Code Compliance: Perform tests in the presence of the Authority Having Jurisdiction (AHJ) where required by the Authority Having Jurisdiction (AHJ).
4. Owner Witness: Perform tests in the presence of the Commissioning Authority, Architect, Architect's Representative, or Owner's representative.
5. Engineer Witness: The engineer or engineer's representative reserves the right to observe tests or selected tests to assure compliance with the specifications.
6. Simultaneous Testing: Test observations by the AHJ, the Owner's Authorized Representative and the engineer's representative need not occur simultaneously.
7. Do not perform TAB work until heating, ventilating, and air conditioning equipment has been completely installed and is operating continuously as required.
8. Conduct air testing and balancing with clean filters in place. Clean strainers prior to performing hydronic testing and balancing.



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9. TAB Conference: Meet with the Commissioning Authority, Owner's and the Architect's representatives on approval of the TAB strategies and procedures plan to develop a mutual understanding of the details. Ensure the participation of TAB team members, equipment manufacturers' authorized service representatives, HVAC controls Installer, and other support personnel. Provide 7 days advance notice of scheduled meeting time and location.
  - a. Agenda Items: Include at least the following:
    - 1) Submittal distribution requirements.
    - 2) Contract Documents examination report.
    - 3) TAB plan.
    - 4) Work schedule and Project site access requirements.
    - 5) Coordination and cooperation of trades and subcontractors.
    - 6) Coordination of documentation and communication flow.
10. Certification of TAB Reports: This certification includes the following:
  - a. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
  - b. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.
11. TAB Reports: Use standard forms from NEBB or AABC.
12. Instrumentation Type, Quantity, and Accuracy: As described in NEBB or AABC.
13. Instrumentation Calibration: Calibrate instruments at least every 6 months or more frequently if required by the instrument manufacturer.

**1.6 WARRANTY**

- A. Warranty of materials and workmanship as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.
- B. In addition, provide:
  1. TAB Agency provides warranty for a period of 90 days following submission of completed report, during which time, Owner may request a recheck of up to 10 percent of total number of terminals, or resetting of outlet, coil, or device listed in the final TAB report.
  2. Guarantee: Meet the requirements of the following programs:
    - a. Provide a guarantee on NEBB or AABC forms stating that the agency will assist in completing the requirements of the Contract Documents if the



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TAB Agent fails to comply with the Contract Documents. Guarantee includes the following provisions:

- 1) The certified Agent has tested, adjusted, and balanced systems according to the Contract Documents.
- 2) Systems are balanced to optimum performance capabilities within design and installation limits.

**1.7 DEFINITIONS**

- A. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to reduce fan speed or adjust a damper.
- B. Balance: To proportion flows within the distribution system, including submains, branches, and terminals, according to design quantities.
- C. Draft: A current of air, when referring to localized effect caused by one or more factors of high air velocity, low ambient temperature, or direction of airflow, whereby more heat is withdrawn from a person's skin than is normally dissipated.
- D. Procedure: An approach to and execution of a sequence of work operations to yield repeatable results.
- E. Report Forms: Test data sheets for recording test data in logical order.
- F. Static Head: The pressure due to the weight of the fluid above the point of measurement. In a closed system, static head is equal on both sides of the pump.
- G. Suction Head: The height of fluid surface above the centerline of the pump on the suction side.
- H. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
- I. System Effect Factors: Allowances used to calculate a reduction of the performance ratings of a fan when installed under conditions different from those presented when the fan was performance tested.
- J. TAB: Testing, Adjusting, and Balancing.
- K. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.
- L. Test: A procedure to determine quantitative performance of a system or equipment.
- M. Testing, Adjusting, and Balancing (TAB) Agent: The entity responsible for performing and reporting the TAB procedures.
- N. AABC: Associated Air Balance Council.
- O. NEBB: National Environmental Balancing Bureau.



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- P. AMCA: Air Movement and Control Association.
- Q. CTI: Cooling Tower Institute.
- R. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association.

**1.8 COORDINATION**

- A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist TAB activities.
- B. Notice: Provide 7 days advance notice for each test. Include scheduled test dates and times.
- C. Witness leakage and pressure tests carried out by Section 23 31 00, HVAC Ducts and Casings.
- D. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

**PART 2 - PRODUCTS - NOT USED**

**PART 3 - EXECUTION**

**3.1 GENERAL REQUIREMENTS AND PROCEDURES**

- A. Project Conditions:
  - 1. Full Owner Occupancy: The Owner will occupy the site and existing building during the entire TAB period. Cooperate with the Owner during TAB operations to minimize conflicts with the Owner's operations.
  - 2. Partial Owner Occupancy: The Owner may occupy completed areas of the building before Substantial Completion. Cooperate with the Owner during TAB operations to minimize conflicts with the Owner's operations.
  - 3. Non-Owner Occupancy: Complete balancing of building systems prior to Substantial Completion and owner occupancy.
- B. General Requirements:
  - 1. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and controls, coordinate scheduling and testing and inspection procedures with authorities having jurisdiction.
  - 2. Perform TAB work with doors, closed windows, and ceilings installed etc., to obtain simulated or project operating conditions. Do not proceed until systems scheduled for TAB are clean and free from debris, dirt and discarded building materials.



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3. Where Owner occupies building during the testing period, cooperate with Owner to minimize conflicts with Owner's operations.

**C. Examination:**

1. Examine Contract Documents to become familiar with project requirements and existing building record documents (if available) to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.
  - a. Contract Documents are defined in the General and Supplementary Conditions of the Contract.
  - b. Verify that balancing devices, such as test ports, gauge cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.
2. Examine approved submittal data of HVAC systems and equipment.
3. Examine Project record documents described in Division 01, General Requirements.
4. Examine Architect's and Engineer's design data, including Basis of Design, 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.
5. Examine equipment performance data, including fan curves. 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. Calculate system effect factors to reduce the performance ratings of HVAC equipment when installed under conditions different from those presented when the equipment was performance tested at the factory. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," Sections 7 through 10; or in SMACNA's "HVAC Systems--Duct Design," Sections 5 and 6. Compare this data with the design data and installed conditions.
6. Coordinate requirements in system and equipment with this Section.
7. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Specification Sections have been performed.
8. Examine system and equipment test reports.
9. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gauge cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are



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properly installed, and their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

10. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.
11. Examine equipment for installation and for properly operating safety interlocks and controls.
12. Report deficiencies discovered before and during performance of TAB procedures.

**D. Preparation:**

1. Prepare a TAB plan that includes strategies and step-by-step procedures.
2. Complete system readiness checks and prepare system readiness reports. Verify the following:
  - a. Permanent electrical power wiring is complete.
  - b. Automatic temperature-control systems are operational.
  - c. Equipment and duct access doors are securely closed.
  - d. Balance, smoke, and fire dampers are open.
  - e. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
  - f. Windows, doors and other portions of the building envelope can be closed so design conditions for system operations can be met.
3. Hold a pre-balancing meeting at least one week prior to starting TAB work.
  - a. Attendance is required by installers whose work will be tested, adjusted, or balanced.
4. Provide instruments required for TAB operations. Make instruments available to Architect to facilitate spot checks during testing.

**E. General TAB Procedures:**

1. Perform TAB procedures on each system according to the procedures contained in NEBB or AABC and this Section.
2. Coordinate location of test probes prior to start of TAB procedures and make test probes available for Owner's tests after start of occupancy. Where required, cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new





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materials identical to those removed. Restore vapor barrier and finish according to the insulation Specifications for this Project.

3. Mark equipment settings with paint or other suitable, permanent identification material, including damper-control positions, valve indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

**F. Adjustment Tolerances:**

1. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 5 percent of design for return and exhaust systems.
2. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design. Adjust outlets and inlets in space to within plus or minus 10 percent of design.
3. Hydronic Systems: Adjust to within plus or minus 10 percent of design at coils and plus or minus 5 percent at system pumps and equipment.
4. Adjust supply, return, and exhaust air quantities to maintain pressurization in spaces indicated on Drawings. Note and document room-to-room pressurization and maintain these relationships. Adjust pressure controlled spaces to within plus or minus 0.01 in WC.

**G. Recording and Adjusting:**

1. Field Logs: Maintain written logs including:
  - a. Running log of events and issues.
  - b. Discrepancies, deficient or uncompleted work by others.
  - c. Contract interpretation requests.
  - d. Lists of completed tests.
2. Ensure recorded data represents actual measured or observed conditions.
3. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
4. Mark on drawings locations where traverse and other critical measurements were taken and cross reference location in final report.
5. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.



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6. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
7. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by Owner's Authorized Representative, or Commissioning Agent.

**3.2 DUCTWORK PRESSURE TESTING**

- A. Test ductwork prior to connection to fan equipment. Repair leaks and retest until stipulated results are achieved.
- B. Provide air pressure testing of ductwork as noted below for various project types and systems:
  1. For other project types or systems: pressure test ductwork in accordance with SMACNA HVAC Air Duct Leakage Test Manual, of representative sections of installed ductwork totaling not less than the total installed duct areas noted below:
    - a. For variable air volume supply, return, or exhaust air systems' ductwork of higher than 2-inches pressure class: pressure test 40 percent of the total installed duct area.
    - b. For variable air volume supply, return, or exhaust air systems' ductwork of 2-inches or less pressure class: pressure test ductwork connected to 10-percent of the total installed duct area of such ductwork, but not less than ductwork connected to two terminal units. Where the tested 10-percent fails to comply, then pressure test 40-percent of the total installed duct area.
    - c. For constant air volume supply, return, or exhaust systems: pressure test 40-percent of the total installed duct area.
  2. Where tests are required, provide separate tests for each of supply, return and exhaust air systems.
  3. Where the tested 40-percent fails to comply with the requirements of this section, then pressure test 100-percent of the total installed duct area. Sections shall be selected by the building owner or the Architect and shall include sections of ductwork upstream and downstream of terminal units. Positive pressure leakage testing may be utilized for negative pressure ductwork.
  4. Area requirement of 40-percent of the total installed duct area is inclusive of ductwork located in shafts or outside building envelope.
- C. Test ductwork prior to connection to fan equipment. Repair leaks and retest until stipulated results are achieved. Pressure testing to meet the following leakage classifications below as a minimum (2012 SMACNA HVAC Air Duct Leakage Manual, Table 4-1):



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1. Leakage class to be as defined below as a minimum.

- a. Minimum Duct Leakage Classification

Duct Type	Leakage Class
<b>Metal (Flexible excluded)</b>	
Round and flat oval	3
Rectangular	6

2. Testing machine: Meet requirements of SMACNA standards. Pacific Air Products "Port-O-Lab", Rolok, or United Sheet Metal.
3. Test supply systems prior to connecting terminal units.
4. Perform tests in presence of Owner's Authorized Representative. Give 48 hours advance notice before commencement of each test.
5. Test ductwork systems in sections as large as possible and record test results accordingly.
6. Leak test grease exhaust ductwork per requirements of latest edition of NFPA-96 and local Mechanical Code.
7. Coordinate testing with ceiling installation.
  - a. Provide sheet-metal plates and install between each duct test section (applies to main-to-main fittings, branch-to-branch fittings and main-to-branch fittings). At each plate location, fabricate joint with Ductmate. Insert 14 gauge sheet metal between Ductmate using a neoprene gasket on both sides of metal plate.
  - b. Leave plates in place until isolated section has been tested and approved by Owner's Authorized Representative.
  - c. Once sections have passed test, remove plates and reattach Ductmate joints. After fan unit is running, test joint for leakage by using a mixture of soap and water. If noise or bubbling occurs, reseal joint. Owner's Authorized Representative to witness this procedure.
8. Test duct at 1.5 times the design air pressure, up to pressure class of the duct. Seal audible leaks.

**3.3 FUNDAMENTAL AIR SYSTEMS BALANCING PROCEDURES**

- A. Examine air-handling equipment to ensure clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.
- B. Examine terminal units, such as variable-air-volume boxes and mixing boxes, to verify that they are accessible and their controls are connected and functioning.



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- C. Prepare test reports for both fans and inlets and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Cross check the summation of required outlet volumes with required fan volumes.
- D. Prepare schematic diagrams of systems' "as-built" duct layouts.
- E. Determine the best locations in main and branch ducts for accurate duct airflow measurements.
- F. Check the airflow patterns from the outside-air louvers and dampers and the return-air and exhaust-air dampers, through the supply-fan discharge and mixing dampers.
- G. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- H. Verify that motor starters are equipped with thermal protection, sized for the connected load.
- I. Check dampers for proper position to achieve desired airflow path.
- J. Check for airflow blockages.
- K. Check that condensate drains are installed, trapped and primed and routed to drain.
- L. Check for readily observable leaks in air-handling unit components and ductwork.
- M. Use sheaves and pulleys to adjust the speed of belt drive fans to achieve design flow with motors running at 60 Hertz unless noted otherwise.

**3.4 TEMPERATURE CONTROL VERIFICATION**

- A. Examine automatic temperature system components to verify the following:
  - 1. Dampers and other controlled devices operate by the intended controller.
  - 2. Dampers are in the position indicated by the controller.
  - 3. Integrity of dampers for free and full operation and for tightness of fully closed and fully open positions. This includes dampers in mixing boxes, and variable-air-volume terminals.
  - 4. Including 2-way valves and 3-way mixing..
  - 5. Thermostats are located to avoid adverse effects of sunlight, equipment, drafts, and cold walls.
  - 6. Sensors are located to sense only the intended conditions.
  - 7. Sequence of operation for control modes is according to the Contract Documents.



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8. Controller set points are set at design values. Observe and record system reactions to changes in conditions. Record default set points if different from design values.
  9. Interlocked systems are operating.
  10. Changeover from heating to cooling mode occurs according to design values.
- B. Verify that controllers are calibrated and commissioned.
  - C. Check transmitter and controller locations and note conditions that would adversely affect control functions.
  - D. Record controller settings and note variances between set points and actual measurements.
  - E. Verify operation of limiting controllers (i.e., high- and low-temperature controllers).
  - F. Verify free travel and proper operation of control devices such as damper and valve operators.
  - G. Verify sequence of operation of control devices. Note air pressures and device positions and correlate with airflow measurements. Note the speed of response to input changes.
  - H. Confirm interaction of electrically operated switch transducers.
  - I. Confirm interaction of interlock and lockout systems.
  - J. Verify main control supply-air pressure and observe compressor and dryer operations.
  - K. Note operation of electric actuators using spring return for proper fail-safe operations.

### 3.5 CONSTANT VOLUME AIR SYSTEMS BALANCING PROCEDURES

- A. Adjust fans to deliver total design airflows within the maximum allowable rpm listed by the fan manufacturer. Adjust fans to deliver design airflow at the lowest possible speed.
  1. Measure fan static pressures to determine actual static pressure as follows:
    - a. Measure outlet static pressure as far downstream from the fan as practicable and upstream from restrictions in ducts such as elbows and transitions.
    - b. Measure static pressure directly at the fan outlet or through the flexible connection.
    - c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from flexible connection and downstream from duct restrictions.
    - d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

2. Measure static pressure across each air-handling unit component under final balanced condition.
3. Compare design data with installed conditions to determine variations in design static pressures versus actual static pressures. Recommend corrective action to align design and actual conditions.
4. Make required adjustments to pulley sizes, motor sizes, and electrical connections to accommodate fan-speed changes.
5. Do not make fan-speed adjustments that result in motor loading greater than full load amps. Do not increase fan speed beyond fan class rating. Modulate dampers and measure fan-motor amperage to ensure no overload will occur. Measure amperage in full cooling, full heating, and economizer modes to determine the maximum required brake horsepower.
6. Adjust volume dampers for main duct, submain ducts, and major branch ducts to design airflows within specified tolerances.
7. Calibrate airflow measuring stations.

### **3.6 VARIABLE AIR VOLUME SYSTEMS ADDITIONAL PROCEDURES**

#### **A. Compensating for Diversity:**

1. When the total airflow of terminal units is more than the fan design airflow volume, place a selected number of terminal units at a maximum set-point airflow condition until the total airflow of the terminal units equals the design airflow of the fan. Select the reduced airflow terminal units so they are distributed evenly among the branch ducts.
2. Pressure-Independent, Variable-Air Volume Systems:
  - a. After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:
    - 1) Set outside-air dampers at minimum, and return-air and exhaust-air dampers at a position that simulates full-cooling load.
    - 2) Select the terminal unit that is most critical to the supply-fan airflow and static pressure. Measure static pressure. Adjust system static pressure to deliver design airflow at the terminal unit.
    - 3) Measure total system airflow. Adjust to within 10 percent of design airflow.
    - 4) Set terminal units at maximum airflow and adjust controller or regulator to deliver the designed maximum airflow. Use the terminal unit manufacturer's written instructions to make this adjustment. When total airflow is correct, balance the air outlets downstream from terminal units.



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- 5) Set terminal units at minimum airflow and adjust controller or regulator to deliver the designed minimum airflow. Check air outlets for a proportional reduction in airflow.
    - (a) If air outlets are out of balance at minimum airflow, report the condition but leave the outlets balanced for maximum airflow.
  - 6) Remeasure the return airflow to the fan while operating at maximum return airflow and minimum outside airflow. Adjust the fan and balance the return-air ducts and inlets.
  - 7) Measure static pressure at the most critical terminal unit and adjust the static-pressure controller at the main supply-air sensing station to ensure adequate static pressure is maintained at the most critical unit. Balance system to achieve the lowest required differential pressure for the system to minimize fan brake horsepower.
  - 8) Balance terminal units in variable volume systems for maximum cooling, maximum heating, and minimum ventilation (demand based ventilation systems) airflow rates.
  - 9) Record the final fan performance data.
3. Additional Requirements: Provide all additional procedures to compensate for diversity as prescribed in NEBB or AABC standards and/or ASHRAE standards.
  4. Calibrate airflow measuring stations.

### **3.7 SERIES FAN POWERED TERMINAL UNIT ADDITIONAL PROCEDURES**

- A. Set primary air valve maximum volume per variable air volume system procedures.
- B. Adjust fan speed to deliver design maximum air flow at air outlets.
- C. Set primary airflow at minimum and verify that airflow at air outlets remains constant.

### **3.8 PRE-BALANCE REPORTING**

- A. Pre-Construction Phase Report:
  1. Provide a pre-construction phase TAB Plan at least 2 weeks prior to the commencement of TAB work. This report is to include:
    - a. A complete set of report forms intended for use on the Project, with all data filled in except for the field readings. Forms to be Project-specific.
    - b. Marked up shop drawings identifying all HVAC equipment to be balanced, and associated outlets and terminal devices.



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- c. Identification of the type, manufacturer, and model of actual instruments to be used, and clear indication of which instrument will be used to take each type of reading. Calibration certifications are to be included.
    - d. A narrative of Project-specific and/or non-standard TAB procedures to be used, and the equipment or systems they apply to.
  - B. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article above, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.
  - C. Status Reports: As Work progresses, prepare reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced.

**3.9 FINAL REPORTS**

- A. Report Requirements:
  - 1. General:
    - a. Computer generated in PDF format and tabulated, divided, and bookmarked into sections by tested and balanced systems.
    - b. Include a certification sheet in front of binder signed and sealed by the certified TAB engineer.
      - 1) Include a list of the instruments used for procedures, along with proof of calibration.
    - c. Final Report Contents: In addition to the 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, but do not include approved Shop Drawings and Product Data
- B. General Report Data:
  - 1. In addition to the form titles and entries, include the following data in the final report, as applicable:
    - a. Title Page





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- b. Name and Address of TAB Agent
- c. Project Name
- d. Project Location
- e. Architect's Name and Address
- f. Engineer's Name and Address
- g. Contractor's Name and Address
- h. Report Date
- i. Signature of TAB Agent who Certifies the Report
- j. Summary of Contents, Including the Following:
  - 1) Design versus Final Performance
  - 2) Notable Characteristics of Systems
  - 3) Description of System Operation Sequence if it varies from the Contract Documents
- k. Nomenclature Sheets for Each Item of Equipment
- l. Data for Terminal Units, including Manufacturer, Type Size, and Fittings
- m. Notes to explain why certain final data in the body of reports vary from design values.
- n. Test Conditions for Fans Performance Forms, Including the Following:
  - 1) Settings for Outside-, Return-, and Exhaust-Air Dampers
  - 2) Conditions of Filters
  - 3) Cooling Coil, Wet- and Dry-bulb Conditions
  - 4) Face and Bypass Damper Settings at Coils
  - 5) Fan Drive Settings, including Settings and Percentage of Maximum Pitch Diameter
  - 6) Inlet Vane Settings for Variable-Air-Volume Systems
  - 7) Settings for Supply-air, Static-pressure Controller
  - 8) Other System Operating Conditions that affect Performance

C. System Diagrams:



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1. Include schematic layouts of air and hydronic distribution systems. Present with single-line diagrams and include the following:
  - a. Quantities of Outside, Supply, Return, and Exhaust Airflows
  - b. Duct, Outlet, and Inlet Sizes
  - c. Terminal Units
  - d. Balancing Stations
- D. Air Handling Units:
  1. For air-handling units, split systems, fan coils, pumps, and evaporator units with coils, include the following:
    - a. Unit Data: Include the following:
      - 1) Unit Identification
      - 2) Location
      - 3) Make and Type
      - 4) Model Number and Unit Size
      - 5) Manufacturer's Serial Number
      - 6) Unit Arrangement and Class
      - 7) Discharge Arrangement
      - 8) Sheave Make, Size in inches, and Bore
      - 9) Sheave Dimensions, Center-to-center and Amount of Adjustments in Inches
      - 10) Number of Belts, Make, and Size
      - 11) Number of Filters, Type, and Size
    - b. Motor Data: Include the following:
      - 1) Make and Frame Type and Size
      - 2) Horsepower and rpm
      - 3) Volts, Phase, and Hertz
      - 4) Full-load Amperage and Service Factor
      - 5) Sheave Make, Size in Inches, and Bore



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- 6) Sheave Dimensions, Center-to-center and Amount of Adjustments in Inches
- c. Test Data: Include design and actual values for the following:
  - 1) Total Airflow Rate in cfm (L/s)
  - 2) Total System Static Pressure in Inches wg (Pa)
  - 3) Fan rpm
  - 4) Discharge Static Pressure in Inches wg (Pa)
  - 5) Filter Static-pressure Differential in Inches wg (Pa)
  - 6) Cooling Coil Static-pressure Differential in Inches wg (Pa)
  - 7) Outside Airflow in cfm (L/s)
  - 8) Return Airflow in cfm (L/s)
  - 9) Outside-air Damper Position
  - 10) Return-air Damper Position
  - 11) Vortex Damper Position
- E. Fans:
  - 1. Fan Test Reports: For supply, return, and exhaust fans, include the following:
    - a. Fan Data: Include the following:
      - 1) System Identification
      - 2) Location
      - 3) Make and Type
      - 4) Model Number and Size
      - 5) Manufacturer's Serial Number
      - 6) Arrangement and Class
      - 7) Sheave Make, Size in Inches, and Bore
      - 8) Sheave Dimensions, Center-to-center and Amount of Adjustments in Inches
    - b. Motor Data: Include the following:



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- 1) Make and Frame Type and Size
- 2) Horsepower and rpm
- 3) Volts, Phase, and Hertz
- 4) Full-load Amperage and Service Factor
- 5) Sheave Make, Size in Inches, and Bore
- 6) Sheave Dimensions, Center-to-center and Amount of Adjustments in Inches
- 7) Number of Belts, Make, and Size

c. Test Data: Include design and actual values for the following:

- 1) Total Airflow Rate in cfm
- 2) Total System Static Pressure in Inches wg
- 3) Fan rpm
- 4) Discharge Static Pressure in Inches wg
- 5) Suction Static Pressure in Inches wg

F. Duct Traverses:

1. Include a diagram with a grid representing the duct cross-section and record the following:

a. Report Data: Include the following:

- 1) System and Air-handling Unit Number
- 2) Location and Zone
- 3) Duct Static Pressure in Inches wg
- 4) Duct Size in Inches
- 5) Duct Area in SF
- 6) Design Airflow Rate in cfm
- 7) Design Velocity in fpm
- 8) Actual Airflow Rate in cfm
- 9) Actual Average Velocity in fpm



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**G. Diffusers/Registers/Grilles:**

1. For diffusers, registers and grilles, include the following:
  - a. Unit Data: Include the following:
    - 1) System and Air-handling Unit Identification
    - 2) Location and Zone
    - 3) Test Apparatus Used
    - 4) Area Served
    - 5) Air-terminal-device Make
    - 6) Air-terminal-device Number from System Diagram
    - 7) Air-terminal-device Type and Model Number
    - 8) Air-terminal-device Size
    - 9) Air-terminal-device Effective Area in SF
  - b. Test Data: Include design and actual values for the following:
    - 1) Airflow Rate in cfm
    - 2) Air Velocity in fpm
    - 3) Final Airflow Rate in cfm
    - 4) Final Velocity in fpm
    - 5) Space Temperature in Degrees F

**H. Compressor and Condensers:**

1. For refrigerant side of unitary systems, stand-alone refrigerant compressors, air-cooled condensing units, or water-cooled condensing units, include the following:
  - a. Unit Data: Include the following:
    - 1) Unit Identification
    - 2) Location
    - 3) Unit Make and Model Number
    - 4) Manufacturer's Compressor Serial Numbers
    - 5) Compressor Make



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- 6) Compressor Model and Serial Numbers
- 7) Refrigerant Weight in Pounds
- 8) Low Ambient Temperature Cutoff in Degrees F
- b. Test Data: Include design and actual values for the following:
  - 1) Inlet-duct Static Pressure in Inches wg
  - 2) Outlet-duct Static Pressure in Inches wg
  - 3) Entering-air, Dry-bulb Temperature in Degrees F
  - 4) Leaving-air, Dry-bulb Temperature in Degrees F
  - 5) Control Settings
  - 6) Unloader Set Points
  - 7) Low-pressure-cutout Set Point in PSIG
  - 8) High-pressure-cutout Set Point in PSIG
  - 9) Suction Pressure in PSIG
  - 10) Suction Temperature in Degrees F
  - 11) Condenser Refrigerant Pressure in PSIG
  - 12) Condenser Refrigerant Temperature in Degrees F
  - 13) Oil Pressure in PSIG
  - 14) Oil Temperature in Degrees F
  - 15) Voltage at Each Connection
  - 16) Amperage for Each Phase
  - 17) The kW Input
  - 18) Crankcase Heater kW
  - 19) Number of Fans
  - 20) Condenser Fan rpm
  - 21) Condenser Fan Airflow Rate in cfm
  - 22) Condenser Ran Motor Make, Frame Size, rpm, and Horsepower



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- 23) Condenser Fan Motor Voltage at Each Connection
- 24) Condenser Fan Motor Amperage for Each Phase

**I. Instrument Calibration:**

- 1. For instrument calibration, include the following:
  - a. Report Data: Include the following:
    - 1) Instrument Type and Make
    - 2) Serial Number
    - 3) Application
    - 4) Dates of Use
  - b. Dates of Calibration

**3.10 ADDITIONAL TESTS**

- A. Within 90 days of completing TAB, perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to correct unusual conditions.
- B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional inspections, testing, and adjusting during near-peak summer and winter conditions.

**END OF SECTION**

**SECTION 23 07 00  
HVAC INSULATION**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Work Included:
  - 1. Type A, Flexible Glass Wool Blanket
  - 2. Type B, Duct Liner
  - 3. Type F, Closed-Cell Polyisocyanurate Rigid Foam Board
  - 4. Type 1, Glass Wool Pipe Insulation
  - 5. Type 2, Flexible Elastomeric Pipe Insulation
  - 6. Jacketing
  - 7. Accessories
  - 8. Duct Insulation Accessories
  - 9. Duct Insulation Compounds

**1.2 RELATED SECTIONS**

- A. Contents of Division 23, HVAC and Division 01, General Requirements apply to this Section.

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.
- B. In addition, meet the following:
  - 1. Piping and duct insulation products to contain less than 0.1 percent by weight PBDE in all insulating materials.

**1.4 SUBMITTALS**

- A. Submittals as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.
- B. In addition, provide:
  - 1. Installer qualifications.
  - 2. Product Data: Identify thermal conductivity, thickness, and jackets (both factory and field applied, if any) for each type of product indicated.



- a. Where indicated R-values/ratings cannot be achieved by a single layer of insulation, describe how performance requirements will be achieved.
3. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets with requirements indicated. Include dates of tests.
4. Installer Certificates: Signed by the Contractor certifying that installers comply with requirements.
5. Submit manufacturer's installation instructions.

### **1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.
- B. In addition, meet the following:
  1. Formaldehyde Free: Should be third-party certified with UL Environment Validation.
  2. Recycled Content: A minimum of 40 percent post-consumer recycled glass content certified and UL validated.
  3. Low Emitting Materials: For all thermal and acoustical applications of Glass Mineral Wool Insulation products, provide materials complying with the testing and products requirements of UL GREENGUARD Gold Certification.
  4. Installer to have minimum 5 years' experience in the business of installing insulation.

### **1.6 WARRANTY**

- A. Warranty of materials and workmanship as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

### **1.7 FIRE HAZARD CLASSIFICATION**

- A. Maximum fire hazard classification of the composite insulation construction as installed to be not more than a Flame Spread Index (FSI) of 25 and Smoke Developed Index (SDI) of 50 as tested by current edition of ASTM E84 (NFPA 255) method.
- B. Test pipe insulation in accordance with the requirements of current edition of UL "Pipe and Equipment Coverings R5583 400 8.15."
- C. Test duct insulation in accordance with current edition of ASTM E84, UL 723, NFPA 255, NFPA 90A and NFPA 90B.

**PART 2 - PRODUCTS**

**2.1 TYPE A, FLEXIBLE GLASS WOOL BLANKET**

- A. Acceptable Manufacturers:
  - 1. Certaineed
  - 2. Johns Manville
  - 3. Knauf
  - 4. Owens-Corning
- B. ASTM C553, Type 1, Class B-2; flexible blanket.
- C. 'K' Value: 0.27 BTU\*in/(hr\*sf°F) at 75 degrees F installed, maximum service temperature: 250 degrees F.
- D. Density: 0.75 pounds per cubic foot.
- E. DBDE-free. UL/E validated to be formaldehyde-free.
- F. Vapor Barrier Jacket: FSK aluminum foil reinforced with glass wool yarn and laminated to fire resistant Kraft, secured with UL listed pressure sensitive tape or outward clinched expanded staples and vapor barrier mastic as needed.

**2.2 TYPE B, DUCT LINER**

- A. Acceptable Manufacturers:
  - 1. Certaineed
  - 2. Johns Manville
  - 3. Knauf
  - 4. Owens-Corning
- B. ASTM C1071; flexible blanket.
- C. 'K' Value: ASTM C518, 0.25 BTU\*in/(hr\*sf°F) at 75 degrees F, maximum service temperature: 250 degrees F.
- D. Noise Reduction Coefficient: 0.65 or higher based on ASTM C 423 "Type A mounting."
- E. Maximum Velocity on Mat or Coated Air Side: 5,000 FPM.
- F. Adhesive: UL listed waterproof type.
- G. Fasteners: Duct liner galvanized steel pins, welded or mechanically fastened.

- H. Erosion-Resistant Surfaces: UL 181.
- I. ASTM G21 and ASTM G22 Microbial Growth Resistance.
- J. UL GREENGUARD Certified does not support the growth of mold, fungi, or bacteria per ASTM C 1338 and meets UL Environment GREENGUARD Microbial Resistance Listing per UL 2824 - "GREENGUARD Certification Program Method for Measuring Microbial Resistance." DBDE-free. UL/E validated to be formaldehyde-free.

**2.3 TYPE F, CLOSED-CELL POLYISOCYANURATE RIGID FOAM BOARD**

- A. Acceptable Manufacturers:
  - 1. Johns Manville
  - 2. Certainteed
  - 3. Knauf
  - 4. RMax
- B. ASTM C1289, Type 1, Class 1.
- C. Thermal Conductivity: 0.16 BTU\*in/(hr\*sf°F).
- D. Service Temperature: -100 degrees F to 250 degrees F.
- E. Jacketing: 0.016-inch thick multi-layered laminate with minimum tensile strength of 149-lb/inch, minimum puncture resistance of 49 pounds per ASTM D1000, maximum emittance of 0.03 per ASTM C1371, maximum WVTR of 0.00 perm per ASTM E96, and min/max service temperature of -40 degrees F to 300 degrees F, as manufactured by 3M, VentureClad1579GCW-E.

**2.4 TYPE 1, GLASS WOOL PIPE INSULATION**

- A. Acceptable Manufacturers:
  - 1. Certainteed
  - 2. Johns Manville
  - 3. Knauf
  - 4. Owens-Corning
- B. Glass Wool: ASTM C547 Type I and IV; rigid molded, noncombustible.
  - 1. Thermal Conductivity Value: As indicated in the insulation tables below.
  - 2. Maximum Service Temperature: 850 degrees F to 1000 degrees F.



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HVAC INSULATION**

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- C. Vapor Retarder Jacket: White Kraft paper reinforced with glass wool and bonded to aluminum foil, secure with self-sealing longitudinal laps and butt strips or vapor barrier mastic.

**2.5 TYPE 2, FLEXIBLE ELASTOMERIC PIPE INSULATION**

- A. Acceptable Manufacturers:
  - 1. Insulation:
    - a. Armacell LLC Armaflex
    - b. K-Flex
    - c. Or approved equivalent.
  - 2. Glue:
    - a. Armacell LLC Armaflex Low VOC Adhesive
    - b. K-Flex
    - c. Or approved equivalent.
  - 3. Paint:
    - a. Armacell LLC Armaflex
    - b. K-Flex
    - c. Or approved equivalent.
- B. Elastomeric Foam: ASTM C534; flexible, cellular elastomeric, molded or sheet.
  - 1. Thermal Conductivity Value: As indicated in the insulation tables below.
  - 2. Maximum Service Temperature of 220 degrees F.
  - 3. Maximum Flame Spread: 25.
  - 4. Maximum Smoke Developed: 50 (1-inch thick and below).
  - 5. Vapor Retarder Jacket, for over 1-inch insulation thickness: White Kraft paper reinforced with glass wool and bonded to aluminum foil, secure with self-sealing longitudinal laps and butt strips or vapor barrier mastic.
  - 6. Connection: Waterproof vapor retarder adhesive as needed.
  - 7. UV Protection: UV outdoor protective coating per manufacturer's requirements.
- C. Glue: Contact adhesive specifically manufactured for cementing flexible elastomeric foam.



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- D. Paint (for exterior insulation only): Nonhardening high elasticity type, specifically manufactured as protective covering of flexible elastomeric foam insulation for prevention of degradation due to exposure to sunlight and weather.

### 2.6 JACKETING

- A. Acceptable Manufacturers:
  - 1. ITW Insulation Systems
  - 2. General Insulation Company
  - 3. Johns Manville
  - 4. 3M
  - 5. Or approved equivalent.
- B. Insulation Jacketing Tape: 0.016-inch thick multi-layered laminate with minimum tensile strength of 149-lb/inch, minimum puncture resistance of 49 pounds per ASTM D1000, maximum emittance of 0.03 per ASTM C1371, maximum WVTR of 0.00 perm per ASTM E96, and min/max service temperature of -40 degrees F to 300 degrees F, as manufactured by 3M, VentureClad1579GCW-E.
- C. PVC preformed molded insulation covers, for piping. Zeston or approved equivalent.
- D. Aluminum Jacket: 0.016-inch-thick sheet, (smooth/embossed) finish, with longitudinal slip joints and 2-inch laps, die-shaped fitting covers with factory attached protective liner.
- E. Stainless Steel Jacket: Type 304 stainless steel, 0.010-inch, smooth finish.
- F. Canvas Jacket: UL listed fabric, 6 ounce/sq.yd., plain weave cotton treated with dilute fire retardant lagging adhesive.

### 2.7 ACCESSORIES

- A. Acceptable Manufacturers:
  - 1. ITW Insulation Systems
  - 2. Or approved equivalent.
- B. Equipment Insulation Jacketing: Presized glass cloth, not less than 7.8 ounces/sq.yd., except as otherwise indicated. Coat with gypsum based cement.
- C. Equipment Insulation Compounds: Provide adhesives, cement, sealers, mastics and protective finishes as recommended by insulation manufacturer for applications indicated.
- D. General: Provide staples, bands, wire, wire netting, tape corner angles, anchors, stud pins and metal covers as recommended by insulation manufacturer for applications indicated. Accessories, i.e., adhesives, mastics, cements and tape to have the same flame and smoke component ratings as the insulation materials with which they are used.

Shipping cartons to bear a label indicating that flame and smoke ratings do not exceed those listed above. Provide permanent treatment of jackets or facings to impart flame and smoke safety. Provide non-water-soluble treatments. Provide UV protection recommended by manufacturer for outdoor installation.

## **2.8 DUCT INSULATION ACCESSORIES**

- A. Acceptable Manufacturers:
  - 1. Certainteed
  - 2. Johns Manville
  - 3. Owens-Corning
- B. Staples, bands, wires, tape, anchors, corner angles and similar accessories as recommended by insulation manufacturer for applications indicated.

## **2.9 DUCT INSULATION COMPOUNDS**

- A. Acceptable Manufacturers:
  - 1. Certainteed
  - 2. Johns Manville
  - 3. Owens-Corning
- B. Cements, adhesives, coatings, sealers, protective finishes and similar accessories as recommended by insulation manufacturer for applications indicated. Comply with South Coast Air Quality Management District (SCAQMD) Rule #1168 in accordance with LLE EQ 4.1.

# **PART 3 - EXECUTION**

## **3.1 GENERAL INSTALLATION REQUIREMENTS**

- A. Verification of Conditions:
  - 1. Do not apply insulation until pressure testing and inspection of ducts and piping has been completed.
  - 2. Examine areas and conditions under which duct and pipe insulation will be installed. Do not proceed with work until unsatisfactory conditions have been corrected.
- B. Preparation: Clean and dry surfaces to be insulated.
- C. Installation:
  - 1. Insulation: Continuous through walls, floors and partitions except where noted otherwise.

2. Piping and Equipment:
  - a. Install insulation over clean, dry surfaces with adjoining sections firmly butted together and covering surfaces. Fill voids and holes. Seal raw edges. Install insulation in a manner such that insulation may be split, removed, and reinstalled with vapor barrier tape on strainer caps and unions. Do not install insulation until piping has been leak tested and has passed such tests. Do not insulate manholes, equipment manufacturer's nameplates, handholes, and ASME stamps. Provide beveled edge at such insulation interruptions. Repair voids or tears.
- D. Cover insulation on exposed refrigerant piping above ground, outside of building with heavy duty multi-layered laminated jacketing tape. Position seams on bottom of pipe. Use 3M VentureClad Plus 1579GCW-E or approved equal.
- E. Provide accessories as required. See Part 2 Article "Accessories" above.
- F. Protection and Replacement: Installed insulation during construction. Replace damaged insulation which cannot be repaired satisfactorily, including units with vapor barrier damage and moisture saturated units.
- G. Labeling and Marking: Provide labels, arrows and color on piping and ductwork. Attach labels and flow direction arrows to the jacketing per Section 23 05 53, Identification for HVAC Piping, Ductwork and Equipment.
- H. Ductwork:
  1. Install insulation in conformance with manufacturer's recommendations to completely cover duct.
  2. Butt insulation joints firmly together and install jackets and tapes smoothly and securely.
  3. Apply duct insulation continuously through sleeves and prepared openings, except as otherwise specified. Apply vapor barrier materials to form complete unbroken vapor seal over insulation.
  4. Coat staples and seals with vapor barrier coating.
  5. Cover breaks in jacket materials with patches of same material as vapor barrier. Extend patches not less than 3-inches beyond break or penetration on all directions and secure with adhesive and staples. Seal staples and joints with vapor barrier coating.
  6. Fill jacket penetrations, i.e., hangers, thermometers and damper operating rods, and other voids in insulation, with vapor barrier coating. Seal penetration with vapor barrier coating. Insulate hangers and supports for cold duct in unconditioned spaces to extent to prevent condensation on surfaces.
  7. Seal and flash insulation terminations and pin punctures with reinforced vapor barrier coating.



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8. Continue insulation at fire dampers and fire/smoke dampers up to and including those portions of damper frame visible at outside of the rated fire barrier. Insulating terminations at fire dampers in accordance with this Section.
9. Do not conceal duct access doors with insulation. Install insulation terminations at access door in accordance with this Section.
- I. Insulated Pipe Exposed to Weather: Where piping is exposed to weather, cover insulation with aluminum jacketing. Seal jacketing watertight per manufacturer's recommendations. Install metal jacketing with 2-inch overlap at longitudinal and butt joints with exposed lap pointing down. Secure jacketing with stainless-steel draw bands 12-inches on center and at butt joints.
- J. Insulation Shields: Provide hangers and shields (18 gauge minimum) outside of insulation for cold piping (<60 degrees F). Hot water piping hangers may penetrate insulation to contact pipe directly. Provide 18-inch long, noncompressible insulation section at insulation shields for lines 2-inches and larger (hot and cold) piping.
- K. Ductwork Surfaces to be Insulated: California

Item to be Insulated	System Insulation Type	Duct Size	Insulation Thickness
Supply ductwork where duct is not specified to be lined.	A	All	1.5-inch
Return ductwork where duct is not specified to be lined.	--	All	None
Supply ductwork (located outside building thermal envelope)	A (for round ductwork) F (for rectangular ductwork)	All	3-inch (for round ductwork) 1.5-inch (for rectangular ductwork)
Return ductwork (located outside building thermal envelope)	A (for round ductwork) F (for rectangular ductwork)	All	3-inch (for round ductwork) 1.5-inch (for rectangular ductwork)
Exhaust ducts within 10-feet of exterior	A	All	3-inch

1. Note: Insulation thickness shown is a minimum. If state codes require additional thickness, then provide insulation thickness per code requirements.



L. Piping Surfaces to be Insulated:

Item to be Insulated	System Insulation Type	Conductivity Range (Btu-inch per hour per SF per degrees F)	Pipe Size (Inches)	Insulation Thickness (Inches)
Refrigerant Suction and Liquid Piping (40F to 60F)	2	0.21-0.27 at a mean rating temperature of 75 degrees F	<1	0.75
			1 to <1.5	0.75
			1.5 to <4	1.0
			4 to <8	1.0
			>= 8	1.0
Refrigerant Suction and Liquid Piping (<=40F)	2	0.20-0.26 at a mean rating temperature of 50 degrees F	<1	1.0
			1 to <1.5	1.5
			1.5 to <4	1.5
			4 to <8	1.5
			>= 8	1.5

- Note: Insulation thickness shown is a minimum. If state code requires additional thickness, then provide insulation thickness per code requirements.

### 3.2 TYPE A, FLEXIBLE GLASS WOOL BLANKET

- Install insulation in conformance with manufacturer's recommendations and requirements.
- Duct Wrap: Cover air ducts per insulation table except ducts internally lined where internal duct lining is adequate to achieve adequate insulating values to meet local Energy Codes (indicate on shop drawings, locations where duct wrap is planned to be omitted and indicate internal duct lining insulating values to confirm they will meet the Energy Code). Wrap tightly with circumferential joints butted and longitudinal joints overlapped minimum of 2-inches. On ducts over 24-inches wide, additionally secure

insulation with suitable mechanical fasteners at 18-inches on center. Circumferential and longitudinal joints stapled with flare staples 6-inches on center and covered with 3-inch wide, foil reinforced tape.

### 3.3 TYPE B, DUCT LINER

- A. Install insulation in conformance with manufacturer's recommendations and requirements.
- B. Duct Liners: Mat finish surface on air stream side. Secure insulation to cleaned sheet metal duct with continuous (minimum 90) percent coat of adhesive. Secure liner with mechanical fasteners 15-inches on center or per manufacturer requirements. Accurately cut liner and thoroughly coat ends with adhesive. Butt joints tightly. Top and bottom sections of insulation overlap sides. Factory/field coat exposed edges. Metal nosing for exposed leading or transverse edges and when velocity exceeds 3500 FPM or manufacturer rating on exposed edges. Keep duct liner clean and free from dust. At completion of Project, vacuum duct liner if it is dirty or dusty. Do not use small pieces. If insulation is installed without horizontal, longitudinal, and end joints butted together, installation will be rejected and work removed and replaced with work that conforms to this Specification.

### 3.4 TYPE F, CLOSED-CELL POLYISOCYANURATE RIGID FOAM BOARD

- A. Install insulation in conformance with manufacturer's recommendations and requirements.

### 3.5 TYPE 1, GLASS WOOL PIPE INSULATION

- A. See General Installation Requirements above.
- B. Install insulation in conformance with manufacturer's recommendations and requirements.
- C. Lap seal insulation with waterproof adhesive. Do not use staples or other methods of attachment which would penetrate vapor barrier. Apply fitting covers with seated tacks and vapor barrier tape.
- D. Apply insulation to pipe and seal with self-sealing lap. Use self-sealing butt strips to seal butt joints. Insulate fittings, valves and unions with single or multiple layers of insulation and cover to match pipe or use preformed PVC molded insulation covers.

### 3.6 TYPE 2, FLEXIBLE ELASTOMERIC PIPE INSULATION

- A. Flexible Elastomeric Insulation:
  - 1. Slip insulation on pipe prior to connection. Butt joints sealed with manufacturer's adhesive. Insulate fitting with miter-cut pieces. Cover insulation exposed to weather and below grade with two coats of finish as recommended by manufacturer.
- B. Flexible Elastomeric Tubing:



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1. Flexible Elastomeric Tubing: Slip insulation over piping or, if piping is already installed, slit insulation and snap over piping. Joints and butt ends must be adhered with 520 adhesive.
- C. See General Installation Requirements above.
- D. Install insulation in conformance with manufacturer's recommendations and requirements.
- E. Slip insulation on pipe prior to connection. Butt joints sealed with manufacturer's adhesive. Insulate fitting with miter-cut pieces. Cover insulation exposed to weather and undergrade with two coats of finish as recommended by manufacturer.
- F. Install in accordance with manufacturer's instructions for below grade installation.

### **3.7 JACKETING**

- A. See General Installation Requirements above.
- B. Install in accordance with manufacturer's instructions.

### **3.8 ACCESSORIES**

- A. Install insulation in conformance with manufacturer's instructions, recommendations and requirements.
- B. See General Installation Requirements above.
- C. Furnish and install accessories for all insulation types listed in this Section.

### **3.9 DUCT INSULATION ACCESSORIES**

- A. Install insulation in conformance with manufacturer's recommendations and requirements.

### **3.10 DUCT INSULATION COMPOUNDS**

- A. Install insulation in conformance with manufacturer's recommendations and requirements.

**END OF SECTION**



**SECTION 23 08 00  
COMMISSIONING OF HVAC**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Work Included:
  - 1. Definitions, warranties, test equipment requirements, and mechanical commissioning requirements.

**1.2 RELATED SECTIONS**

- A. Contents of Division 23, HVAC and Division 01, General Requirements apply to this Section.
- B. In addition, reference the following:
  - 1. Section 01 91 13, General Commissioning Requirements.

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.
- B. In addition, meet the following:
  - 1. Current edition of ASHRAE Guideline 0, The Commissioning Process.

**1.4 SUBMITTALS**

- A. Submittals as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.
- B. In addition, provide:
  - 1. Certificates of readiness.
  - 2. Certificates of completion of installation, prestart, and startup activities.
  - 3. Operation and Maintenance Manuals.
  - 4. Test reports.
  - 5. Control Drawings Submittal
    - a. Provide a key to abbreviations.
    - b. Provide graphic schematic depictions of the systems and each component.

- c. Include the system and component layout of any equipment that the control system monitors, enables or controls, even if the equipment is primarily controlled by packaged or integral controls.
- d. Provide a full points list with at least the following included for each point:
  - 1) Controlled system
  - 2) Point abbreviation
  - 3) Point description
  - 4) Display unit
  - 5) Control point or set point (Yes / No)
  - 6) Monitoring point (Yes / No)
  - 7) Intermediate point (Yes / No)
  - 8) Calculated point (Yes / No)
- 6. Architect forwards one set of submittals for systems to be commissioned to Commissioning Agent at same time as design team.
- 7. Commissioning Agent forwards comments to design team for consideration in their submittal response.
- 8. Design team sends consolidated response to submittals and copies to Commissioning Agent.

#### **1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.
- B. Test Equipment Calibration Requirements: Contractors will comply with test manufacturer's calibration procedures and intervals. Recalibrate test instruments immediately after instruments have been repaired resulting from being dropped or damaged. Affix calibration tags to test instruments. Furnish calibration records to Commissioning Authority upon request.

#### **1.6 WARRANTY**

- A. Warranty of materials and workmanship as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.
- B. In addition, provide:
  - 1. Commissioning, inspecting, and testing will not modify terms or time periods of mechanical equipment, systems, and controls warranties including related equipment and systems, and adjacent work.



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2. Control system warranty period starts from date of Commissioning Agent acceptance.

**1.7 COORDINATION**

- A. Reference Section 01 91 13, General Commissioning Requirements, for requirements pertaining to coordination during the commissioning process.

**1.8 PURPOSE**

- A. Purpose of commissioning process is to provide Owner assurance that systems have been installed in prescribed manner and will operate within performance guidelines. Commissioning is intended to enhance quality of system startup and aid in orderly transfer of systems to beneficial use by Owner.
- B. Commissioning procedures and results will be observed by Commissioning Authority or Owner's staff. Contractor is expected to verify functional readiness of systems to be tested prior to performing the tests in presence of Owner's witness. A high rate of test failure will indicate that Contractor has not adequately verified readiness of systems.

**PART 2 - PRODUCTS**

**2.1 TEST EQUIPMENT**

- A. Provide standard testing equipment required to perform startup, initial checkout and functional performance testing for the equipment being tested. For example, the mechanical contractor of Division 23, HVAC will ultimately be responsible for standard testing equipment for the HVAC&R system and controls system in Division 23, HVAC, except for the equipment specific to and used by TAB in their commissioning responsibilities. Provide a sufficient quantity of two-way radios by each subcontractor.
- B. Include special equipment, tools and instruments (specific to a piece of equipment and only available from vendor) required for testing in the base bid price to the Owner and leave on site, except for stand-alone data logging equipment that may be used by the Commissioning Authority.
- C. Manufacturer of equipment to provide proprietary test equipment and software required for programming and/or start-up, whether specified or not. Manufacturer provides the test equipment, demonstrates its use, and assists in the commissioning process as needed. Proprietary test equipment (and software) become the property of the Owner upon completion of the commissioning process.
- D. Data logging equipment and software required to test equipment will be provided by the Commissioning Authority, and will not become the property of the Owner.
- E. Use only testing equipment of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the specifications. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers have a certified calibration within the past year to an accuracy of 0.5 degree F and a resolution of plus or minus 0.1 degree F. Pressure sensors have an accuracy of plus or minus 2.0 percent of the value range being measured (not full range of meter) and have been calibrated within the last year.



**PART 3 - EXECUTION**

**3.1 GENERAL DOCUMENTATION REQUIREMENTS**

- A. With assistance from the installing contractors, the Commissioning Authority will prepare pre-functional checklists for commissioned components, equipment, and systems
- B. Red-Lined Drawings:
  - 1. Verify equipment, systems, instrumentation, wiring and components are shown correctly on red-lined drawings.
  - 2. Preliminary red-lined drawings must be made available to the Commissioning Team for use prior to the start of Functional Performance Testing.
  - 3. Changes, as a result of Functional Testing, must be incorporated into the final as-built drawings, which will be created from the red-lined drawings.
  - 4. The contracted party, as defined in the Contract Documents will create the as-built drawings.
- C. Operation and Maintenance (O&M) Data:
  - 1. Contractor will provide a copy of O&M literature within 45 days of each submittal acceptance for use during the commissioning process for commissioned equipment and systems.
  - 2. The Commissioning Authority will review the O&M literature once for conformance to project requirements.
  - 3. The Commissioning Authority will receive a copy of the final approved O&M literature once corrections have been made by the Contractor.
- D. Demonstration and Training:
  - 1. Contractor will provide demonstration and training as required by the specifications.
  - 2. A complete training plan and schedule must be submitted by the contractor to the Commissioning Authority four weeks prior to any training.
  - 3. A training agenda for each training session must be submitted to the Commissioning Authority one week prior the training session.
  - 4. Notify the Commissioning Authority at least 72 hours in advance of scheduled tests so that testing may be observed by the Commissioning Authority and Owner's Authorized Representative. Provide a copy of the test record to the Commissioning Authority, Owner, and Architect.
  - 5. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain specific equipment.

6. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, trouble shooting, servicing, and maintaining equipment.
  7. Review data in O&M Manuals.
- E. Systems Manual Requirements:
1. The Systems Manual is intended to be a usable information resource containing the information related to the systems, assemblies, and Commissioning Process in one place with indexes and cross references.
  2. Include final approved versions of the following information for the Systems Manual:
    - a. Facility Description.
    - b. Basis of Design (A/E).
    - c. A list of contractors, subcontractors, suppliers, architects, and engineers involved in the project along with their contact information.
    - d. Overview of each commissioned system including operational schedules and sequence of operations.
    - e. General maintenance recommendations and procedures.
    - f. Recommendations for recalibration frequency of sensors and actuators
    - g. Recommended best practices for keeping the system running efficiently.
    - h. Blank Functional Performance Tests so the Owner can recommission the facility at a later date.
  3. Organize and arrange information by building system, such as fire alarm, chilled water, heating hot water, etc.
  4. Provide Information in an electronic version to the extent possible. Legible, scanned images are acceptable for non-electronic documentation to facilitate this deliverable.

### **3.2 CONTRACTOR'S RESPONSIBILITIES**

- A. Mechanical, Controls and TAB Contractors. The commissioning responsibilities applicable to each of the mechanical, controls and TAB contractors of Division 23, HVAC are as follows (references apply to commissioned equipment only):
1. Perform commissioning tests at the direction of the Commissioning Authority.
  2. Attend construction phase controls coordination meetings.
  3. Attend testing, adjusting, and balancing review and coordination meetings.



4. Participate in HVAC&R systems, assemblies, equipment, and component maintenance orientation and inspection as directed by the Commissioning Authority.
  5. Provide information requested by the Commissioning Authority for final commissioning documentation.
  6. Include requirements for submittal data, operation and maintenance data, and training in each purchase order or subcontract written.
  7. Prepare preliminary schedule for mechanical system orientations and inspections, operation and maintenance manual submissions, training sessions, pipe and duct system testing, flushing and cleaning, equipment start-up, testing and balancing and task completion for owner. Distribute preliminary schedule to commissioning team members.
  8. Update schedule as required throughout the construction period.
  9. During the startup and initial checkout process, execute the related portions of the prefunctional checklists for commissioned equipment.
  10. Contractor to participate and complete checklists using the Commissioning Authority's web based commissioning software Facility Grid. A desktop, laptop, tablet, or iPad will be required.
  11. Assist the Commissioning Authority in verification and functional performance tests.
  12. Gather operation and maintenance literature on equipment, and assemble in binders as required by the specifications. Submit to Commissioning Authority 45 days after submittal acceptance.
- B. Coordinate with the Commissioning Authority to provide 48 hour advance notice so that the witnessing of equipment and system start-up and testing can begin.
- C. Notify the Commissioning Authority a minimum of two weeks in advance of the time for start of the testing and balancing work. Attend the initial testing and balancing meeting for review of the official testing and balancing procedures.
- D. Participate in, and schedule vendors and contractors to participate in the training sessions.
- E. Provide written notification to the Construction Manager/General Contractor (CM/GC) and Commissioning Authority that the following work has been completed in accordance with the Contract Documents, and that the equipment, systems, and sub-system are operating as required.
1. HVAC&R equipment including fans, air handling units, ductwork, dampers, terminals, and other equipment furnished under this Division.
  2. Fire stopping in the fire rated construction, including fire and smoke damper installation, caulking, gasketing and sealing of smoke barriers.



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- 3. Fire detection and smoke detection devices furnished under other divisions of the specification.
- F. Equipment supplier to document the performance of his equipment.
- G. Test, Adjust and Balance Contractor:
  - 1. Attend initial commissioning coordination meeting scheduled by the Commissioning Authority.
  - 2. Participate in verification of the testing and balancing report, which will consist of repeating measurements contained in the testing and balancing reports. Assist in diagnostic purposes when directed.
- H. Provide training of the Owner's operating staff using expert qualified personnel, as specified.
- I. Equipment Suppliers:
  - 1. Provide requested submittal data, including detailed start-up procedures and specific responsibilities of the Owner, to keep warranties in force.
  - 2. Assist in equipment testing per agreements with contractors.
  - 3. Provide information requested by Commissioning Authority regarding equipment sequence of operation and testing procedures.
- J. Reference Section 01 91 13, General Commissioning Requirements for additional contractor responsibilities.

### 3.3 OWNER'S RESPONSIBILITIES

- A. Reference Section 01 91 13, General Commissioning Requirements for Owner's Responsibilities.

### 3.4 DESIGN PROFESSIONAL'S RESPONSIBILITIES

- A. Reference Section 01 91 13, General Commissioning Requirements for Design Professional's Responsibilities.

### 3.5 COMMISSIONING AUTHORITY'S RESPONSIBILITIES

- A. Reference Section 01 91 13, General Commissioning Requirements for Commissioning Authority's Responsibilities.

### 3.6 TESTING PREPARATION

- A. Certify in writing to the Commissioning Authority that HVAC&R systems, subsystems, and equipment have been installed, calibrated, and started and are operating according to the Contract Documents.

- B. Certify in writing to the Commissioning Authority that HVAC&R instrumentation and control systems have been completed and calibrated, that they are operating according to the Contract Documents, and that pretest set points have been recorded.
- C. Certify in writing that testing, adjusting, and balancing procedures have been completed and that testing, adjusting, and balancing reports have been submitted, discrepancies corrected, and corrective work approved.
- D. Place systems, subsystems, and equipment into operating mode to be tested (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).
- E. Inspect and verify the position of each device and interlock identified on checklists.
- F. Check safety cutouts, alarms, and interlocks with smoke control and life-safety systems during each mode of operation.
- G. Testing Instrumentation: Install measuring instruments and logging devices to record test data as directed by the Commissioning Authority.

### **3.7 TESTING, ADJUSTING AND BALANCING VERIFICATION**

- A. Prior to performance of Testing, Adjusting and Balancing work, provide copies of reports, sample forms, checklists, and certificates to the Commissioning Authority.
- B. Notify the Commissioning Authority at least 10 days in advance of testing and balancing Work, and provide access for the Commissioning Authority to witness testing and balancing Work.
- C. Provide technicians, instrumentation, and tools to verify testing and balancing of HVAC&R systems at the direction of the Commissioning Authority.
  - 1. The Commissioning Authority will notify testing and balancing subcontractor 10 days in advance of the date of field verification. Notice will not include data points to be verified.
  - 2. Testing and balancing subcontractor to use the same instruments (by model and serial number) that were used when original data were collected.
  - 3. Failure of an item includes, other than sound, a deviation of more than 10 percent. Failure of more than 10 percent of selected items to result in rejection of final testing, adjusting, and balancing report. For sound pressure readings, a deviation of 3 dB to result in rejection of final testing. Variations in background noise must be considered.
  - 4. Remedy the deficiency and notify the Commissioning Authority so verification of failed portions can be performed.

### **3.8 GENERAL TESTING REQUIREMENTS**

- A. Provide technicians, instrumentation, and tools to perform commissioning test at the direction of the Commissioning Authority.

- B. Scope of HVAC&R testing to include entire HVAC&R installation, from central equipment for heat generation and refrigeration through distribution systems to each conditioned space. Testing to include measuring capacities and effectiveness of operational and control functions.
- C. Test operating modes, interlocks, control responses, and responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.
- D. The Commissioning Authority along with the HVAC&R contractor, testing and balancing Subcontractor, and HVAC&R Instrumentation and Control Subcontractor to prepare detailed testing plans, procedures, and checklists for HVAC&R systems, subsystems, and equipment.
- E. Tests will be performed using design conditions whenever possible.
- F. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions as directed by the Commissioning Authority and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.
- G. The Commissioning Authority may direct that set points be altered when simulating conditions is not practical.
- H. The Commissioning Authority may direct that sensor values be altered with a signal generator when design or simulating conditions and altering set points are not practical.
- I. If tests cannot be completed because of a deficiency outside the scope of the HVAC&R system, document the deficiency and report it to the Owner. After deficiencies are resolved, reschedule tests.
- J. If the testing plan indicates specific seasonal testing, complete appropriate initial performance tests and documentation and schedule seasonal tests.

### **3.9 HVAC&R SYSTEMS, SUBSYSTEMS, AND EQUIPMENT TESTING PROCEDURES**

- A. Equipment Testing and Acceptance Procedures: Testing requirements are specified in individual Division 23, HVAC Sections. Provide submittals, test data, inspector record, and certifications to the Commissioning Authority.
- B. HVAC&R Instrumentation and Control System Testing: Field testing plans and testing requirements are specified in Division 23, HVAC Sections "Instrumentation and Control for HVAC" and "Sequence of Operations for HVAC Controls." Assist the Commissioning Authority with preparation of testing plans.
- C. Pipe System Cleaning, Flushing, Hydrostatic Tests, and Chemical Treatment: Test requirements are specified in Division 23, HVAC Piping Sections. HVAC&R Contractor to prepare a pipe system cleaning, flushing, and hydrostatic testing plan. Provide cleaning, flushing, testing, and treating plan and final reports to the Commissioning Authority. Plan to include the following:

1. Sequence of testing and testing procedures for each section of pipe to be tested, identified by pipe zone or sector identification marker. Markers keyed to Drawings for each pipe sector, showing the physical location of each designated pipe test section. Provide drawings keyed to pipe zones or sectors formatted to allow each section of piping to be physically located and identified when referred to in pipe system cleaning, flushing, hydrostatic testing, and chemical treatment plan.
  2. Description of equipment for flushing operations.
  3. Minimum flushing water velocity.
  4. Tracking checklist for managing and ensuring that pipe sections have been cleaned, flushed, hydrostatically tested, and chemically treated.
- D. The work included in the commissioning process involves a complete and thorough evaluation of the operation and performance of components, systems and sub-systems. Evaluate the following equipment and systems:
1. HVAC Equipment and Systems (all)
  2. Boiler
  3. Building Automation System
  4. Chilled Water System
  5. Computer Room AC
  6. Domestic Hot Water Systems
  7. Renewable Energy Systems
  8. Pumps
  9. VFDs

**3.10 DEFICIENCIES/NONCONFORMANCE, COST OF RETESTING, FAILURE DUE TO MANUFACTURER DEFECT**

- A. Reference Division 01, General Requirements for requirements pertaining to deficiencies/nonconformance, cost of retesting, or failure due to manufacturer defect.

**3.11 OPERATION AND MAINTENANCE MANUALS**

- A. The Operation and Maintenance Manuals to conform to Contract Documents requirements as stated in Division 23, HVAC.
- B. Provide an updated as-built version of the control drawings and sequences of operation in the final controls O&M manual submittal.

### 3.12 TRAINING OF OWNER PERSONNEL

A. Mechanical Contractor's Training Responsibilities:

1. Provide the Commissioning Authority with a training plan two weeks before the planned training.
2. Provide designated Owner personnel with comprehensive orientation and training in the understanding of the systems and the operation and maintenance of each piece of HVAC equipment including, but not limited to, HVAC equipment (i.e., pumps, heat exchangers, chillers, heat rejection equipment, air conditioning units, air handling units, fans, terminal units, controls and water treatment systems, etc.).
3. Training starts with classroom sessions followed by hands-on training on each piece of equipment to illustrate the various modes of operation, including startup, shutdown, fire/smoke alarm, power failure, etc.
4. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.
5. The appropriate trade or manufacturer's representative provides the instructions on each major piece of equipment. This person may be the start-up technician for the piece of equipment, the installing contractor or manufacturer's representative. Practical building operating expertise as well as in-depth knowledge of modes of operation of the specific piece of equipment are required. More than one party may be required to execute the training.
6. Controls contractor to attend sessions other than the controls training, as requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.
7. The training sessions follow the outline in the Table of Contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.
8. Training Includes:
  - a. Use of the printed installation, operation and maintenance instruction material included in the O&M manuals.
  - b. A review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. Training to include start-up, operation in all modes possible, shut-down, seasonal changeover and any emergency procedures.
  - c. Discussion of relevant health and safety issues and concerns.
  - d. Discussion of warranties and guarantees.



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- e. Common troubleshooting problems and solutions.
  - f. Explanatory information included in the O&M manuals and the location of plans and manuals in the facility.
  - g. Discussion of any peculiarities of equipment installation or operation.
9. Schedule training after functional testing is complete, unless approved otherwise by the Owner.
- B. Controls Contractor's Training Responsibilities:
- 1. Provide the Commissioning Authority and A/E with a training plan four weeks before the planned training.
  - 2. Provide designated Owner personnel training on the control system in this facility. The intent is to clearly and completely instruct the Owner on the capabilities of the control system.
  - 3. Training manuals. The standard operating manual for the system and any special training manuals will be provided for each trainee, with three extra copies left for the O&M manuals. In addition, copies of the system technical manual will be demonstrated during training and three copies submitted with the O&M manuals. Manuals include detailed description of the subject matter for each session. Manuals to cover control sequences and have a definitions section that fully describes relevant words used in the manuals and in software displays. Manuals will be approved by the Commissioning Authority and A/E. Deliver copies of audiovisuals to the Owner.
  - 4. The trainings will be tailored to the needs and skill-level of the trainees.
  - 5. The trainers will be knowledgeable on the system and its use in buildings. For the on-site sessions, the most qualified trainer(s) will be used. Owner to approve the instructor prior to scheduling the training.
  - 6. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.
  - 7. Attend sessions other than the controls training, as requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.
  - 8. Three Training Sessions, as Follows:
    - a. Training I - Control System. The first training consists of eight hours of actual training. This training may be held on-site or in the supplier's facility. If held off-site, the training may occur prior to final completion of the system installation. Upon completion, each student, using appropriate documentation, should be able to perform elementary operations and describe general hardware architecture and functionality of the system.



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- b. Training II - Building Systems. The second session held on-site for a period of eight hours of actual hands-on training after the completion of system commissioning. The session includes instruction on:
- 1) Specific hardware configuration of installed systems in this building and specific instruction for operating the installed system, including HVAC systems, lighting controls and any interface with security and communication systems.
  - 2) Security levels, alarms, system start-up, shut-down, power outage and restart routines, changing set points and alarms and other typical changed parameters, overrides, freeze protection, manual operation of equipment, optional control strategies that can be considered, energy savings strategies and set points that if changed will adversely affect energy consumption, energy accounting, procedures for obtaining vendor assistance, etc.
  - 3) Trending and monitoring features (values, change of state, totalization, etc.), including setting up, executing, downloading, viewing both tabular and graphically and printing trends. Trainees will actually set-up trends in the presence of the trainer.
  - 4) Completely discuss every screen, allowing time for questions.
  - 5) Use of keypad or plug-in laptop computer at the zone level.
  - 6) Use of remote access to the system via phone lines or networks.
  - 7) Setting up and changing an air terminal unit controller.
  - 8) Graphics generation.
  - 9) Point database entry and modifications.
  - 10) Understanding DDC field panel operating programming (when applicable).
- c. Training III - The third training will be conducted on-site six months after occupancy and consist of eight hours of training. The session will be structured to address specific topics that trainees need to discuss and to answer questions concerning operation of the system.

**END OF SECTION**



**SECTION 23 09 33  
ELECTRIC AND ELECTRONIC CONTROL SYSTEM FOR HVAC**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Work Included:
  - 1. Room Thermostats
  - 2. Smoke Detection for Projects with a Building Fire Alarm System
  - 3. Relays and Contactors
  - 4. Transformers
  - 5. Wiring
  - 6. Damper Operators

**1.2 RELATED SECTIONS**

- A. Contents of Division 23, HVAC and Division 01, General Requirements apply to this Section.
- B. In addition, reference the following:
  - 1. Power wiring per Division 26, Electrical.

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

**1.4 SUBMITTALS**

- A. Submittals as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.
- B. In addition, provide:
  - 1. Drawings: complete control diagram, including written description of control sequences.
  - 2. Operation and Maintenance Manual: Include record wiring drawings showing installed condition and operating changes made during start-up.

**1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.



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**1.6 WARRANTY**

- A. Warranty of materials and workmanship as outlined in Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.
- B. In addition, provide:
  - 1. Within 30 days prior to warranty expiration date, control supplier to visit job site and check calibration, operation, and adjustment of temperature, pressure and humidity sensors, valves, dampers, thermostats and other devices installed by control supplier. Make repair or replacement of defective control equipment as required at no charge to Owner.
  - 2. Submit letter to Architect certifying that this work has been completed.
  - 3. Attach copy of service report signed by Owner's Authorized Representative.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Room Thermostats:
  - 1. Honeywell
  - 2. Siemens
  - 3. Johnson Controls
  - 4. Reliable Controls
  - 5. Alerton
- B. Duct/Spot-Type Smoke Detectors (Project with Fire Alarm System):
  - 1. See Division 28 for Products.
- C. Damper Operators:
  - 1. Belimo
  - 2. Honeywell
  - 3. Siemens
  - 4. Or approved equivalent.

**2.2 ROOM THERMOSTATS**

- A. For packaged equipment, including direct expansion split and air terminal units, provide thermostats/controllers as manufactured by packaged equipment manufacturer.



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- B. Electronic Thermostat:
  - 1. Seven day programmable, PI control.
  - 2. Occupied/unoccupied heat and cool setpoints.
  - 3. Automatic heat/cool changeover and fan control.
  - 4. Touch screen display.
  - 5. Cooling Stages: Provide as required to match in air conditioner.
  - 6. Basis of Design: Honeywell RTH 7600D.
- C. Electronic BACnet Thermostat/Controller: Wall mounted, 24 VAC, LED display, up to three universal inputs, up to four outputs, dedicated temperature sensor, up to four pre-programmed control strategies.

**2.3 SMOKE DETECTION FOR PROJECTS WITH A BUILDING FIRE ALARM SYSTEM**

- A. See Division 26 for Products.

**2.4 RELAYS AND CONTACTORS**

- A. Provide relays and contactors where required or as shown on Drawing to meet operating sequence where not internal to manufacturer's equipment.
- B. Furnish relays or contactors with required coil voltage and contact amperage rating for use specified on Drawing and in manufacturer's equipment.
- C. Mount relays in single control cabinet with hinge door and latch.
- D. Control cabinet contains relays and numbered terminal strips for connection of relays and field wiring. Mount cabinet on painted plywood panel securely attached to wall framing. Mount time clock, transformer and motor contactors (if required) on plywood adjacent to control panel.

**2.5 TRANSFORMERS**

- A. Transformers selected and sized for appropriate VAC capacity and installed and fused according to applicable codes. Provide wiring to nearest suitable power source as required.

**2.6 WIRING**

- A. In accordance with Division 26, Electrical and applicable codes.
- B. Provide line and low voltage wiring relating to control system. Includes wiring of contactors, relays, circuits, and incidental power wiring: operation power for time clock, power when run through stat/timeclock/relay, transformers.



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**2.7 DAMPER OPERATORS**

- A. Size operators to operate dampers properly against system pressures, pressure differentials and velocities. Damper operators sized for 150 percent of damper forces normally encountered. Spring return closed for outside air applications.

**PART 3 - EXECUTION**

**3.1 SEQUENCE OF OPERATION**

- A. RTU-1: Modulate economizer cycle, cooling, heating, and supply fan in sequence to maintain supply air temperature and static pressure setpoints. Interlock VAV boxes to operate when RTU is in operation. Dampers to be closed on fan shutdown and during NLL operation. Program to time schedule coordinated with owner. See below for fire shut-down.
- B. AC Units: Room thermostats to control cooling and heating in sequence to maintain setpoint.
- C. Night Low Limit: Provide night low limit thermostat to bypass system clock to cycle air terminal unit fans and heaters to maintain night setting of 60 degrees F.
- D. Bypass Timer: To override system and ventilation clocks, one timer for RTU-1.
- E. Central timeclock: Program equipment to start/stop at times determined with Owner; set times and demonstrate to Owner during programming. Set timeclock to start/stop the following equipment:
  - 1. RTU-1
  - 2. EF-1
- F. Exhaust Fans:
  - 1. Exhaust fan EF-1: Controlled from ventilation time clock per 3.01.D.
  - 2. Air terminal units: Room thermostats to modulate cooling, heating, and fan in sequence to maintain temperature setpoint. Primary air damper to be closed on fan shutdown and during NLL operation. Program thermostats to time schedule coordinated with owner. See below for fire shut-down. When RTU-1 return air smoke detector detects products of combustion, RTU-1 and associated VAV boxes shall de-energize, dampers shall close, and an alarm shall be sent to the fire alarm system.
- G. Air terminal units: Room thermostats to modulate cooling, heating, and fan in sequence to maintain temperature setpoint. Primary air damper to be closed on fan shutdown and during NLL operation. Program thermostats to time schedule coordinated with owner. See below for fire shut-down.
- H. When RTU-1 return air smoke detector detects products of combustion, RTU-1 and associated VAV boxes shall de-energize, dampers shall close, and an alarm shall be sent to the fire alarm system.



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**3.2 SMOKE DETECTION FOR PROJECTS WITH A BUILDING FIRE ALARM SYSTEM**

- A. Smoke detector furnished and powered/wired under Division 28, Electronic Safety and Security. Coordinate with fire alarm equipment supplier. Installation of duct smoke detector housing and sampling tube under Division 23, HVAC.
- B. Install smoke detectors in return air systems greater than 2000 CFM.

**3.3 INSTALLATION OF AUXILIARY CONTROL DEVICES**

- A. General:
  - 1. Install sensors and thermostats in accordance with manufacturer's recommendations.
  - 2. Room sensors and thermostats installed at 48-inches AFF to midline of sensor on concealed junction boxes properly supported by wall framing at the locations shown on the Drawings.
- B. Actuators:
  - 1. General:
    - a. Mount and link control damper actuators according to manufacturer's instructions.
    - b. Check operation of damper/actuator combination to confirm that actuator modulates damper smoothly throughout stroke to both open and closed positions.
  - 2. Actuator Mounting for Damper and Valve arrangements to comply to the following:
    - a. Damper Actuators: Do not install in the air stream.
    - b. Use a weatherproof enclosure (clear and see through) if actuators are located outside.
    - c. Damper or valve actuator ambient temperature not-to-exceed 122 degrees F through any combination of medium temperature or surrounding air. Provide appropriate air gaps, thermal isolation washers or spacers, standoff legs, or insulation as necessary. Mount per manufacturer's recommendations.
    - d. Actuator cords or conduit to incorporate a drip leg if condensation is possible. Do not allow water to contact actuator or internal parts. Location of conduits in temperatures dropping below dew point to be avoided to prevent water from condensing in conduit and running into actuator.

**END OF SECTION**

**SECTION 23 21 13  
HVAC PIPING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Work Included:
  - 1. Equipment Drains and Overflows
  - 2. Unions
  - 3. Refrigerant Piping

**1.2 RELATED SECTIONS**

- A. Contents of Division 23, HVAC and Division 01, General Requirements apply to this Section.

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

**1.4 SUBMITTALS**

- A. Submittals as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.
- B. In addition, provide:
  - 1. Welding Certificates: Copies of certificates for welding procedures and personnel.
  - 2. Field Test Reports: Written reports of tests specified in Part 3 of this Section. Include the following:
    - a. Test procedures used.
    - b. Test results that comply with requirements.
    - c. Failed test results and corrective action taken to achieve requirements.

**1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.
- B. In addition, meet the following:
  - 1. Installer Qualifications: Company specializing in performing work of the type specified in this Section, with documented experience.



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2. Welder Qualifications: Certify in accordance with ASME (BPV IX).
3. ASME Compliance: Comply with ASME B31.9 "Building Services Piping" for materials, products, and installation. Provide safety valves and pressure vessels with the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 01.
4. Refrigerant Piping:
  - a. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX "Welding and Brazing Qualifications."
  - b. ASHRAE Standard: Comply with ASHRAE 15, "Safety Code for Mechanical Refrigeration."
  - c. ASME Standard: Comply with ASME B31.5, "Refrigeration Piping."
  - d. UL Standard: Provide products complying with UL 207, "Refrigerant-Containing Components and Accessories, Nonelectrical" or UL 429 "Electrically Operated Valves."

### 1.6 WARRANTY

- A. Warranty of materials and workmanship as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

## PART 2 - PRODUCTS

### 2.1 EQUIPMENT DRAINS AND OVERFLOWS

- A. Copper Tube: ASTM B 88 (ASTM B 88M), Type L (B), drawn.
  1. Fittings: ASME B16.18, cast brass, or ASME B16.22 solder wrought copper.
  2. Joints: Solder, lead free, ASTM B 32, HB alloy (95-5 tin-antimony), or tin and silver.
  3. Joints: Brazed, AWS A5.8, Classification BAg-36, non-cadmium silver alloy. Pipes 2-1/2-inch or larger or piping routed over food preparation centers, food serving facilities, food storage areas, computer rooms, telecommunications rooms, and electrical rooms.

### 2.2 UNIONS

- A. Unions for Pipe 2-inches and Under:
  1. Ferrous Piping: 150, 250, and 300 PSIG malleable iron, threaded, ASME B16.39.
  2. Copper Pipe: Bronze, soldered joints, ASME B16.22.



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- B. Dielectric Connections: Provide dielectric waterway or brass nipple fitting with threaded ends. Dielectric unions are not allowed.

### 2.3 REFRIGERANT PIPING

- A. Piping:
  - 1. Copper Tube: ASTM B 280, Type ACR, annealed-temper tube, clean, dry and capped.
    - a. Fittings: ASME B16.22 wrought copper.
    - b. Joints: Braze, AWS A5.8 Classification BCuP-5, 15 percent silver alloy.
- B. Valves:
  - 1. Manufacturers:
    - a. Hansen Technologies Corporation
    - b. Henry Technologies
    - c. Danfoss Flomatic
    - d. Substitutions: See Section 23 00 00, HVAC Basic Requirements, Division 00, Procurement and Contracting Requirements and Division 01, General Requirements.
  - 2. Packaged Ball Valves:
    - a. Two piece bolted forged brass body with Teflon ball seals and copper tube extensions, brass seal cap, chrome plated ball, stem with neoprene ring stem seals; for maximum working pressure of and maximum temperature of 300 degrees F.
- C. Flexible Connectors:
  - 1. Manufacturers:
    - a. Metraflex, VRF Flex, model VAV-RF8
    - b. Or approved equivalent.
  - 2. Provide stainless steel refrigerant flexible connector with copper ends, operating at 700 psi, cleaned and bagged per PRAXAIR 99.

## PART 3 - EXECUTION

### 3.1 GENERAL INSTALLATION REQUIREMENTS

- A. Install per manufacturer's written instructions and requirements.
- B. Preparation:





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1. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
2. Remove scale and dirt on inside and outside before assembly.
3. Prepare piping connections to equipment with flanges or unions.
4. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

### C. Above Grade Piping Installation:

1. Install per manufacturer's written instructions and requirements.
2. Route piping in orderly manner, parallel to building structure, and maintain gradient.
3. Install piping to conserve building space and to avoid interference with use of space.
4. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.
5. Sleeve pipe passing through partitions, walls and floors allowing adequate space for pipe insulation.
6. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
7. Anchor piping for proper direction of expansion and contraction.
8. Inserts:
  - a. Provide inserts for placement in concrete formwork.
  - b. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
  - c. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4-inches.
  - d. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
  - e. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut flush with top of slab.
9. Pipe Hangers and Supports:
  - a. Install in accordance with Section 23 05 29, Hangers and Supports for HVAC Piping, Ductwork and Equipment.

- b. Install hangers to provide minimum 1/2-inch space between finished covering and adjacent work.
  - c. Place hangers within 12-inches of each horizontal elbow.
  - d. Use hangers with 1-1/2-inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
  - e. Support vertical piping at top, bottom, and not less than every other floor. Support riser piping independently of connected horizontal piping.
  - f. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
  - g. Prepare unfinished pipe, fittings, supports, and accessories, ready for finish painting.
  - h. Provide copper plated hangers and supports for copper piping.
  - i. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
- 10. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
  - 11. Provide access where valves and fittings are not exposed.
  - 12. Use eccentric reducers to maintain top of pipe level.
  - 13. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.
  - 14. Prepare unfinished pipe, fittings, supports, and accessories, ready for finish painting.

**D. Field Quality Control:**

- 1. Leave joints, including welds, uninsulated and exposed for examination during test.
- 2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
- 3. Flush system with clean water. Clean strainers.
- 4. Isolate equipment from piping. If a valve is used to isolate equipment, provide closure capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.

5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.

**E. Flushing and Cleaning of Piping Systems:**

1. Clean piping systems thoroughly. Purge pipe of construction debris and contamination before placing the piping systems in service. Provide temporary connections for cleaning, purging, and circulating fluids through the piping system.
2. Use temporary strainers and temporary pumps that can create a minimum fluid velocity of 6-feet per second and maximum of 10-feet per second to flush and clean the piping systems. Do not use Owner's permanent strainers to trap debris during pipe flushing operations. Fit the temporary construction strainers with a line size blowoff valve.
3. When constructing minor piping modifications or additions, verify with Owner if the Owner's pumps and strainers can be used for flushing and chemical cleaning operations. When the flushing and cleaning operations are complete, ensure the strainer baskets and screens installed in the piping systems permanent strainers are replaced with clean elements. Keep temporary strainers in service until the equipment has been tested, then replace straining element with a new strainer and clean and deliver the old straining elements to Owner. Fit the Owner's strainers with a line size blowoff valve.
4. Install bypass piping or hoses at the supply and return piping connections at heat exchangers, chillers, cooling towers, pumps, and cooling coils, etc., to prevent debris from being caught or causing damage to equipment which will be connected to the piping system.
5. Circulate a chemical cleaner in chilled and heating water piping systems to remove mill scale, grease, oil, and silt. Cleaner to be selected by chemical treatment vendor on project. Circulate for 48 hours, flush system and replace with clean water. Dispose of chemical solution in accordance with local codes. The chilled and heating water system should then be treated with chemicals and inhibitors to be selected by chemical treatment vendor on project. When the chemical cleaning is complete, remove, clean, and reinstall all permanent screens. Notify Owner so that the reinstallation of clean strainer screens may be witnessed.

**F. Pipe Painting Requirements:**

1. Paint all ferrous metal pipe including flanges. Do not paint flange bolts, washers and nuts. At flexible coupling the only the flanges are to be painted. All rubber portions are to remain unpainted.
2. Paint exterior uninsulated steel piping with exterior latex, semi-gloss (AE), Master Painters Institute MPI 11, suitable for metallic surfaces B, Haze Gray color.
3. Use ready-mixed (including colors) paint. Prime paint with pigment and vehicle, compatible with substrate and finish coats specified. Volatile Organic Compounds (VOC) content of paint materials shall not exceed 50g/l for exterior latex paints and primers. Lead-based paint is not permitted.

4. Do not apply coating when air or substrate conditions are:
  - a. Less than 5 degrees F above dew point.
  - b. Below 50 degrees F or over 95 degrees F, unless specifically pre-approved by the product manufacturer.
5. Do no exterior painting when it is windy and dusty. Do not paint in direct sunlight or on surfaces that the sun will soon warm.
6. Apply only on clean, dry and frost-free surface. Remove all materials that will affect the ability of the paint to adhere to the pipe including painted pipe identification labels.
7. Remove oil, grease, soil, drawing and cutting compounds, flux and other detrimental foreign. Remove loose mill scale, rust, and paint, by hand or power tool cleaning. All surfaces are to be dry at the time paint is applied.
8. Apply paint in two coats; prime, and finish. Apply each coat evenly and cover substrate completely. Allow not less than 48 hours between application of succeeding coats, except as allowed by manufacturer's printed instructions.
9. Finish surfaces to show solid even color, free from runs, lumps, brushmarks, laps, holidays, or other defects. Apply by brush, roller or spray.

### **3.2 REFRIGERANT PIPING INSTALLATION**

- A. Install systems in accordance with ASHRAE Standard 15.
- B. Group piping whenever practical at common elevations and locations. Slope piping one percent in direction of oil return.
- C. Arrange piping to return oil to compressor. Provide traps and loops in piping, and provide double risers as required. Slope horizontal piping 0.40 percent in direction of flow.
- D. Flood piping system with nitrogen when brazing.
- E. Follow ASHRAE Standard 15 procedures for charging and purging of systems and for disposal of refrigerant.
- F. Provide replaceable cartridge filter-driers, with isolation valves and valved bypass.
- G. Locate expansion valve sensing bulb immediately downstream of evaporator on suction line.
- H. Fully charge completed system with refrigerant after testing.
- I. Install flexible connectors at connection to equipment with compressors or at fan coil units installed with a vibration isolator.
- J. Field Quality Control:
  1. Test refrigeration system in accordance with ASME B31.5.



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2. Pressure test system with dry nitrogen to 200 PSI. Perform final tests at 27-inches vacuum and 200 PSI using electronic leak detector. Test to no leakage.

**END OF SECTION**

**SECTION 23 31 00  
HVAC DUCTS AND CASINGS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Work Included:
  - 1. Ductwork, Joints, and Fittings
  - 2. Insulated Flexible Duct
  - 3. Drain Pans
  - 4. Ductwork Joint Sealers and Sealants

**1.2 RELATED SECTIONS**

- A. Contents of Division 23, HVAC and Division 01, General Requirements apply to this Section.
- B. In addition, reference the following:
  - 1. Section 23 05 29, Hangers and Supports for HVAC Piping, Ductwork and Equipment.
  - 2. Section 23 05 93, Testing, Adjusting, and Balancing for HVAC.

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

**1.4 SUBMITTALS**

- A. Submittals as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.
- B. In addition, provide:
  - 1. Welding Certificates.
  - 2. Field Quality Control Reports.

**1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.
- B. In addition, meet the following:
  - 1. NFPA Compliance:



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- a. NFPA 90A, Installation of Air Conditioning and Ventilating Systems.
- b. NFPA 90B, Installation of Warm Air Heating and Air Conditioning Systems.
2. Comply with NFPA 96, Ventilation Control and Fire Protection of Commercial Cooking Operations, Ch. 3, Duct System for range hood ducts, unless otherwise indicated.
3. Comply with SMACNA's HVAC Duct Construction Standards - Metal and Flexible for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated. Provide sheet metal materials free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
4. Provide ductwork pressure testing and leakage testing per Section 23 05 93, Testing, Adjusting, and Balancing for HVAC.

#### **1.6 WARRANTY**

- A. Warranty of materials and workmanship as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

#### **1.7 SYSTEM DESCRIPTION**

- A. Duct system design, as indicated, has been used to select size and type of air-moving and distribution equipment and other air system components. Duct design is generally diagrammatic and is not meant to be scaled. Major changes to layout or configuration of duct system must be specifically approved in writing by Architect. Accompany requests for layout modifications with calculations showing that proposed layout will provide original design results without increasing system total pressure.

### **PART 2 - PRODUCTS**

#### **2.1 DUCTWORK, JOINTS, AND FITTINGS**

- A. Materials:
  1. Galvanized Steel Ducts: Hot-dipped galvanized steel sheet, lock-forming quality, ASTM A 653/A 653M FS Type B, with G90/Z275 coating, minimum 26 gauge except where heavier material is specified. Ducts to have mill phosphatized finish for surfaces exposed to view.
- B. Fabricate ducts, elbows, transitions, offsets, branch connections, and other construction according to SMACNA's HVAC Duct Construction Standards - Metal and Flexible and complying with requirements for metal thickness, reinforcing types and intervals, tie-rod applications, and joint types and intervals.
  1. Lengths: Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure class.
  2. Deflection: Duct systems not-to-exceed deflection limits according to SMACNA's HVAC Duct Construction Standards - Metal and Flexible.



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3. Transverse Joints: Prefabricated slide-on joints and components constructed using manufacturer's guidelines for material thickness, reinforcement size and spacing, and joint reinforcement.
- C. Formed-On Flanges: construct according to SMACNA's HVAC Duct Construction Standards - Metal and Flexible, Figure 1-4, using corner, bolt, cleat, and gasket details.
  1. Duct Size: Maximum 30-inches wide and up to 2-inch wg pressure class.
  2. Longitudinal Seams: Pittsburgh lock sealed with noncuring polymer sealant.
  3. Cross Breaking or Cross Beading: Cross break or cross bead duct sides 19-inches and larger and 0.0359-inch thick or less, with more than 10 SF of nonbraced panel area unless ducts are lined.
- D. Round, Spiral Lock-Seam Ducts: Fabricate supply ducts of material specified in this Section according to SMACNA's HVAC Duct Construction Standards - Metal and Flexible.
  1. Ducts up to 20-inches in Diameter: Interior, center-beaded slip coupling, sealed before and after fastening, attached with sheet metal screws.
  2. Round Ducts: Prefabricated connection system consisting of double-lipped, EPDM rubber gasket. Manufacture ducts according to connection system manufacturer's tolerances.
- E. 90-Degree Tees and Laterals and Conical Tees: Fabricate to comply with SMACNA's HVAC Duct Construction Standards-Metal and Flexible, with metal thicknesses specified for longitudinal-seam straight ducts.
- F. Diverging-Flow Fittings: Fabricate with reduced entrance to branch taps and with no excess material projecting from fitting onto branch tap entrance.
- G. Fabricate elbows using die-formed, gored, pleated, or mitered construction. Bend radius of die-formed, gored, and pleated elbows to be 1.5 times duct diameter. Unless elbow construction type is indicated, fabricate elbows as follows:
  1. Mitered-Elbow Radius and Number of Pieces: Welded construction complying with SMACNA's HVAC Duct Construction Standards-Metal and flexible, unless otherwise indicated.
  2. Round Mitered Elbows: Welded construction with the following metal thickness for pressure classes from minus 2- to plus 2-inch wg (minus 500 to plus 500 Pa):
    - a. Ducts 3- to 36-inches in Diameter: 0.034-inch.
    - b. Ducts 37- to 50-inches in Diameter: 0.040-inch.
    - c. Ducts 52- to 60-inches in Diameter: 0.052-inch.
    - d. Ducts 62- to 84-inches in Diameter: 0.064-inch.





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3. Round Mitered Elbows: Welded construction with the following metal thickness for pressure classes from 2- to 10-inch wg:
  - a. Ducts 3- to 26-inches in Diameter: 0.034-inch.
  - b. Ducts 27- to 50-inches in Diameter: 0.040-inch.
  - c. Ducts 52- to 60-inches in Diameter: 0.052-inch.
  - d. Ducts 62- to 84-inches in Diameter: 0.064-inch.
4. 90-Degree, Two-Piece, Mitered Elbows: Use only for supply systems or for material-handling Class A or B exhaust systems and only where space restrictions do not permit using radius elbows. Fabricate with single-thickness turning vanes.
5. Round Elbows:
  - a. 8-inches and Less in Diameter: Fabricate die-formed elbows for 45 and 90-degree elbows and pleated elbows for 30, 45, 60 and 90 degrees only. Fabricate nonstandard bend-angle configurations or non-standard diameter elbows with gored construction.
  - b. 9 through 14-inches in Diameter: Fabricate gored or pleated elbows for 30, 45, 60 and 90 degrees unless space restrictions require mitered elbows. Fabricate nonstandard bend-angle configurations or nonstandard diameter elbows with gored construction.
  - c. Larger than 14-inches in Diameter and All Flat-Oval Elbows: Fabricate gored elbows unless space restrictions require mitered elbows.
6. Die-Formed Elbows for Sizes through 8-inches in Diameter and Pressures 0.040-inch thick with two-piece welded construction.
7. Round Gored-Elbow Metal Thickness: Same as non-elbow fittings specified above.
8. Pleated Elbows for Sizes through 14-inches in Diameter and Pressures through 10-inch wg (2500 Pa): 0.022-inch.
9. Not acceptable:
  - a. Corrugated or flexible metal duct.
  - b. Adjustable elbows.

**2.2 INSULATED FLEXIBLE DUCT**

- A. Manufacturers:
  1. ATCO



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2. Flexmaster
  3. J.P. Lamborn Co.
  4. Hart and Cooley
- B. Construction: Standard factory fabricated product. Inner wall: Impervious vinyl or chlorinated polyethylene, permanently bonded to a vinyl or zinc-coated spring steel helix.
- C. Insulation: Fiberglass blanket insulation covered by an outer wall of vinyl or fiberglass-reinforced metalized vapor barrier.
- D. Listing: UL 181 listed Class 1 flexible air duct material. Overall thermal transmission: No more than 0.25 BTU/in or hr/sq. degrees F at 75 degrees F differential, per ASTM C335.
- E. Vapor transmission value no more than 0.10 perm, per ASTM E96.
- F. Pressure Rating: 4-inch wg positive pressure and 1-inch wg negative pressure.
- G. Performance Air Friction Correction Factor: 1.3 maximum at 95 percent extension. Working air velocity: Minimum 2000 FPM.
- H. Flame Spread Rating: No more than 25.
- I. Smoke Development Rating: No more than 50 as tested per ASTM E84.
- J. Insertion Loss: Minimum attenuation of 29 DB for 10-foot straight length at 8-inch diameter at 500 Hz.

**2.3 DRAIN PANS**

- A. Primary Drain Pans: Stainless Steel, fabricated in accordance with ASTM A167 and A480.
- B. Secondary Drain Pans: Galvanized Steel: Hot-dipped galvanized steel sheet, ASTM A 653/A 653M FS Type B, with G90/Z275 coating.

**2.4 DUCTWORK JOINT SEALERS AND SEALANTS**

- A. Manufacturers:
1. Ductmate
  2. Duro Dyne
  3. Hardcast
  4. United McGill Corporation
  5. Vulkem
  6. Foster

- 7. Childer
- 8. Design Polymetrics (DP)
- B. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
- C. Low Emitting Materials Requirement: Adhesives, sealants and sealant primers must comply with South Coast Air Quality Management District (SCAQMD) Rule #1168.
- D. Type: Heavy mastic or liquid, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure and leakage class of ducts.
- E. Surface Burning Characteristics: Flame spread of zero, smoke developed of zero, when tested in accordance with ASTM E 84.
- F. Water Based Sealant for Brush-On Application: Flexible, adhesive sealant, resistant to UV light, UL-181A, and UL-181-B listed, complying with NFPA requirements for Class 1 ducts. Min. 69 percent solids, nonflammable. Hardcast Versa-Grip 181; Childers CP-146; Foster 32-19 for SMACNA 1/2, 1, 2, 3, 4, 6, and 10-inch WG duct classes, and SMACNA Seal Class A, B, or C.
- G. Flanged Joint Mastic: One-part, acid-curing, silicone, elastomeric joint sealant complying with ASTM C920, Type S, Grade NS, Class 25, Use O.
- H. Flange Gaskets: Butyl rubber or EPDM polymer with polyisobutylene plasticizer.
- I. Polyurethane Sealant: General-purpose, exterior use, non-brittle sealant for gunned application. Vulkem 616 or equal.

### **PART 3 - EXECUTION**

#### **3.1 GENERAL INSTALLATION REQUIREMENTS**

- A. General: Use the following pressure seal, and leakage class(es) in design of ductwork specified in this section unless otherwise noted on Drawings.

<b>SYSTEM</b>	<b>PRESSURE CLASS (Inches of Water)</b>	<b>SEAL CLASS</b>	<b>LEAKAGE CLASS ROUND DUCTS</b>	<b>LEAKAGE CLASS RECTANGULAR DUCTS</b>
Medium Pressure Supply (fan to terminal unit)	0.5-inch higher than air handlers discharge pressure (min 4-inch pressure class).	A	2	4
Low Pressure (downstream)	+ 1-inch	A	2	4



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of terminal unit)				
Return and Exhaust	0.5-inch more negative than return/exhaust fan pressure or - 2-inch pressure class, whichever is more negative.	A	2	4

**B. Ductwork Installation:**

1. General: Install entire duct system in accordance with drawings, Specifications, and latest issues of local Mechanical Code, NFPA 90A, and SMACNA Duct Construction Manual. At Contractor's option, rectangular ductwork may be resized to maintain an equivalent air velocity and friction rate, while maintaining a maximum aspect ratio of 3. Remove markings and tagging from ductwork exterior surface in mechanical rooms and other locations where ductwork is exposed.
2. The duct layout shown on the Contract Drawings is diagrammatic in nature. Coordinate the ductwork routing and layout, and make alterations to the ductwork routing and layout to eliminate physical interferences. Where deviations in the ductwork routing as shown in the Contract Drawings are required, alterations may be made so as not to compromise the air flow, pressure drop, and sound characteristics of the duct fitting or duct run as shown on the Contract Drawings. In the event Architect determines that the installed ductwork is inconsistent with the above mentioned criteria, remove and replace at no additional cost to the Owner.
3. Install ducts with fewest possible joints.
4. Install fabricated fittings for changes in directions, size, shape, and for connections.
5. Install couplings tight to duct wall surface with a minimum of projections into duct. Secure couplings with sheet metal screws. Install screws at intervals of 12-inches, with a minimum of 3 screws in each coupling.
6. Install ducts, unless otherwise indicated, vertically and horizontally and parallel and perpendicular to building lines; avoid diagonal runs.
7. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
8. Install ducts with a clearance of 1-inch, plus allowance for insulation thickness. Allow for easy removal of ceiling tile.
9. Conceal ducts from view in finished spaces. Do not encase horizontal runs in solid partitions unless specifically indicated.



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10. Coordinate layout with suspended ceiling, air duct accessories, lighting layouts, and similar finish work.
  11. Electrical and IT Equipment Spaces: Route ducts to avoid passing through transformer vaults, electrical equipment spaces, IDF/MPOE rooms, and enclosures.
  12. Non-Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls and are exposed to view, conceal spaces between construction openings and ducts or duct insulation with sheet metal flanges of same metal thickness as ducts. Overlap openings on 4 sides by at least 1-1/2-inches.
  13. Fire- and Smoke-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, install appropriately rated fire, smoke or combination fire and smoke dampers as governed by Building Code and AHJ, including sleeves, and firestopping sealant.
  14. Install ducts with hangers and braces designed to withstand, without damage to equipment, seismic force required by applicable building codes. Reference SMACNA's Seismic Restraint Manual: Guidelines for Mechanical Systems, Mason Seismic Restraint and Support Systems.
  15. Protect duct interiors from the elements and foreign materials until building is enclosed. Follow SMACNA's Duct Cleanliness for New Construction Advanced Level.
  16. Paint interiors of metal ducts, that do not have duct liner, for 24-inches upstream of registers and grilles. Apply one coat of flat, black, latex finish coat over a compatible duct material.
  17. Install ductwork in the location and manner shown and detailed. Review deviations required by job conditions with Architect prior to any fabrication. Provide fittings for construction per SMACNA.
  18. Install flexible ductwork to limit sag between support hangers to 1/2-inch per foot of spacing support.
- C. Flanged Take-Offs:
1. Install at branch takeoffs to outlets using round or flex duct.
  2. Flanged take-offs secured with minimum 8-inch screw spacing (three screws minimum).
  3. Provide ductwork taps and branches off of main ducts at 45 degrees whether shown on Drawings or not (drawings are diagrammatic).
- D. Cleaning:



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1. Clean duct systems with high power vacuum machines. Protect equipment that could be harmed by excessive dirt with filters, or bypass during cleaning. Provide adequate access into ductwork for cleaning purposes.
2. Grille and Exposed Duct Cleaning:
  - a. After completion of ductwork installation, operate each fan system (excluding exhaust fans) for a minimum of 30 minutes prior to installation of ceiling grilles and diffusers. After grilles and diffusers are installed, clean out accumulation of particles from grilles and diffusers prior to acceptance.
  - b. Clean exterior surface of ducts exposed to public view of chalk, pencil and pen marks, labels, sizing tags, dirt, dust, etc., so that upon completion of installation, ducts are left in clean and unblemished manufactured conditions.
  - c. Exposed duct and grilles to remain free of dust entrained streaks due to leakage at joints and grille connections during warranty period. Clean leaks, seal and refinish to match existing if visible streaks develop.

**3.2 DUCTWORK, JOINTS, AND FITTINGS INSTALLATION**

**A. Duct Materials - Applied Locations:**

1. General: Use the following materials in design of ductwork specified in this Section unless otherwise noted on the Drawings.

<b>Location or Application</b>	<b>Material</b>
Supply, Return, Transfer, and Exhaust - Low Pressure (downstream of terminal units)	Single Wall, Galvanized Steel
Supply, Return, and Exhaust - Medium Pressure (upstream of terminal units)	Single Wall, Galvanized Steel
General Exhaust Branch Serving Air Inlet in Shower Room or Toilet Room with Shower	Single Wall, Aluminum or Type 304 Stainless Steel
Supply, Return, Exhaust serving Natatorium, Pool, or Spa Area	Single Wall, Aluminum or Type 304 Stainless Steel
Fume Hood Exhaust	Single Wall, Type 316 Stainless Steel
Ductwork for the First 15-feet Downstream of Humidifier	Single Wall, Type 316 Stainless Steel

**B. Ductwork Installation:**

1. Fabricate radius elbows with centerline radius not less than 1-1/2 duct diameters.

2. Do not install duct size transition pitch angles which exceed 30 degrees for reductions in duct size in the direction of airflow, and 15 degrees for expansions in duct size in the direction of airflow.
3. Install fixed turning vanes in square throat rectangular elbows and in tees.
4. Fabricate duct turns with the inside (smallest) radius at least equal to the duct width (supply ducts) and 1.5 times radius (return and exhaust ducts). Where necessary, square elbows may be used, with maximum available inside radius and with fixed turning vanes. In healthcare settings such as hospitals and medical office buildings, square elbows and turning vanes allowed on supply ductwork only.

### **3.3 INSULATED FLEXIBLE DUCT INSTALLATION**

- A. Provide sheet metal plenum or rigid elbow and connect to diffusers and grilles with ductwork connections. Refer to Drawings for more information. Provide straight section of flexible duct with minimum length of 2-feet and maximum length of 5-feet and connect to sheet metal plenums and rigid elbows connected to diffusers and grilles, unless noted otherwise.
  1. Provide round neck grilles/diffusers or square-to-round transitions. Flexible duct connections directly to diffuser and grilles is not allowed.
  2. Flexible duct allowed in concealed spaces above lay-in ceilings only.

### **3.4 DRAIN PANS INSTALLATION**

- A. Install where shown on Drawings. Drain provided by Division 22, Plumbing. Provide drain (sized per code) connection from each drain pan and pipe to nearest floor drain through trap and 10-inch air gap. Drain pans over 6-feet in length require drain connections from both ends. Pitch drain pans in direction of air flow and to drain. Support secondary drain pan independently from equipment.

### **3.5 DUCTWORK JOINT SEALERS AND SEALANTS INSTALLATION**

- A. Joints and Seam Joint Sealing:
  1. Seal duct seams and joints according to SMACNA's HVAC Duct Construction Standards - Metal and Flexible, for duct pressure class indicated.
  2. Seal transverse joints, longitudinal seams and duct wall penetrations including screw, fastener, pipe, rod, and wire.
  3. Seal ducts before external insulation is applied.
  4. Fasteners such as sheet-metal screws, machine screws or rivets to be cadmium plated.
  5. Rectangular Ductwork: Where intermediate joint reinforcement is required for duct of negative pressure class, pre-drill stiffening flange and provide fastener



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maximum 8-inches on center. Where retaining flanges are welded to duct wall, paint welds with zinc coating.

6. Single Wall Round Ductwork: Joint to incorporate beaded slip collar with minimum #8 sheet metal screws 8-inches on center. Seal ductwork as specified in this Section.
7. Seal joints and seams. Apply sealant to make end connectors before insertion, and afterward to cover entire joint and sheet metal screws.
8. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.
9. Provide openings in ductwork where required to accommodate thermometers and control devices. Provide pitot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.
10. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities as well as Code required clearances.

**END OF SECTION**



**SECTION 23 33 00  
AIR DUCT ACCESSORIES**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Work Included:
  - 1. Sheet Metal Materials
  - 2. Backdraft Dampers
  - 3. Dampers
  - 4. Concealed Damper Hardware
  - 5. Access Doors
  - 6. Duct Test Holes
  - 7. Turning Vanes
  - 8. Flexible Connectors

**1.2 RELATED SECTIONS**

- A. Contents of Division 23, HVAC and Division 01, General Requirements apply to this Section.

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

**1.4 SUBMITTALS**

- A. Submittals as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.
- B. In addition, provide:
  - 1. Manufacturer's catalog data and fabrication/installation drawings for each factory fabricated duct accessory. Include leakage, pressure drop and maximum back pressure data.
  - 2. Shop Drawings: Indicate air duct accessories.
  - 3. Manufacturer's installation instructions: Provide instructions for each factory fabricated duct accessory.



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4. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - a. See Division 01, General Requirements, Product Requirements for additional provisions.
  - b. Extra Fusible Links: One of each type and size.

**1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.
- B. In addition, meet the following:
  1. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this Section, with minimum five years of documented experience.
  2. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
  3. AMCA 500 - Test Methods for Louvers, Dampers and Shutters.
  4. AMCA 511 - Certified Ratings Program for Air Control Devices.
  5. AMCA 611, latest edition - Certified Ratings Program - Product Rating Manual for Airflow Measurement Stations.
  6. AMCA 610, latest edition - Laboratory Methods of Testing Airflow Measurement Stations for Performance Rating.
  7. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.
  8. NFPA 92A - Smoke-Control Systems.
  9. NFPA 92B - Smoke Control Systems in Atria, Covered Malls and Large Areas.
  10. NFPA 101 - Life Safety Code.
  11. UL 555 - Standard for Safety; Fire Dampers.
  12. UL 555S - Standard for Safety; Leakage Rated Dampers for Use in Smoke Control Systems.

**1.6 WARRANTY**

- A. Warranty of materials and workmanship as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

**PART 2 - PRODUCTS**

**2.1 SHEET METAL MATERIALS**

- A. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated.
- B. Galvanized Sheet Steel: Lock-forming quality; complying with ASTM A 653/A 653M. Galvanizing: 1-1/4 ounces per square foot total both sides; ducts to have mill-phosphatized finish for surfaces exposed to view.
- C. Stainless Steel: ASTM A 480/A 480M.
- D. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- E. 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.

**2.2 BACKDRAFT DAMPERS**

- A. Manufacturers:
  - 1. Air Balance
  - 2. Cesco
  - 3. Greenheck
  - 4. Nailor
  - 5. Ruskin
- B. Basis-of-Design: Ruskin CB D6.
- C. Description: Multiple-blade gravity balanced with center pivoted blades with sealed edges, assembled in rattle free manner with 90-degree stop, adjustment device to permit setting for varying differential static pressure.
- D. Frame: 0.125-inch thick 6063-T5 extruded aluminum channel with galvanized steel braces at mitered corners. Provide mounting flange.
- E. Blades: Single piece, overlap frame, parallel action, horizontal orientation, minimum 0.07-inch 6063-T5 extruded aluminum material, maximum 6-inch width.
- F. Bearings: Corrosion-resistant synthetic, formed as single piece with axles.
- G. Blade Seals: Extruded vinyl, mechanically attached to blade edge.



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- H. Blade Axles: Corrosion-resistant, synthetic formed as single piece with bearings, locked to blade.
- I. Tie Bars and Brackets: Galvanized steel.
- J. Return Spring: Adjustable tension.
- K. Damper Capacity:
  - 1. Closed Position: Maximum back pressure of 16-inches water gauge.
  - 2. Open Position: Maximum air velocity of 2,500-feet per minute.
- L. Counterbalances: Adjustable zinc plated steel weights mechanically attached to blade. Must be capable of operating over wide range of pressures.
- M. Finish: Mill aluminum.
- N. Temperature Rating: -40 degrees F to 200 degrees F.
- O. Operation of Blade:
  - 1. Start to Open: 0.01-inch wg
  - 2. Fully Open: 0.05-inch.
- P. Pressure Drop: Maximum 0.15-inch wg at 1,500-feet per minute through 24-inch by 24-inch damper.
- Q. Factory Sleeve: Minimum 20 gauge thickness, 12-inches in length.
- R. Screen: At outdoor intake or discharge. 1/4-inch aluminum.

**2.3 DAMPERS**

- A. Manufacturers:
  - 1. Air Balance
  - 2. Cesco
  - 3. Greenheck
  - 4. Nailor
  - 5. Ruskin
- B. Basis-of-Design:
  - 1. Rectangular ductwork for velocities and pressures up to 1,500 fpm and 2.5-inch wg, respectively: Ruskin MD-35.



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2. Rectangular ductwork for velocities and pressures up to 3,000 fpm and 4-inch wg, respectively: Ruskin CD-60.
  3. Round ductwork for velocities and pressures up to 3,000 fpm and 4-inch wg, respectively: Ruskin CDSR-15.
- C. General Description: Factory fabricated, with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.
1. Pressure Classes of 3-Inch wg (750 Pa) or Higher: End bearings or other seals for ducts with axles full length of damper blades and bearings at both ends of operating shaft.
- D. Rectangular Volume Dampers: Multiple- or single-blade, parallel- or opposed-blade design with linkage concealed in frame and suitable for horizontal or vertical applications.
1. Steel Frames: Hat-shaped, galvanized sheet steel channels, minimum 16 gauge thick, with mitered and welded corners; frames with flanges where indicated for attaching to walls and flangeless frames where indicated for installing in ducts.
    - a. Roll-Formed Steel Blades: Galvanized sheet steel, 16 gauge thick for velocities up to 1,500 fpm, and 14 gauge thick for velocities up to 3,000 fpm.
    - b. Blade Axles: Minimum 1/2-inch diameter, plated steel, hex shaped, mechanically attached to blade.
    - c. Bearings: Molded synthetic sleeve, turning in extruded hole in frame.
    - d. Tie Bars and Brackets: Galvanized steel.
    - e. Mill galvanized.
- E. Round Volume Dampers: Single-blade suitable for horizontal or vertical applications.
1. Steel Frames: Galvanized, roll formed, minimum of 20 gauge thick with beads at each end.
  2. Blades: Minimum 14 gauge thick, galvanized sheet steel, round, single-piece.
  3. Blade Axles: Minimum 1/2-inch square, plated steel, mechanically attached to blade.
  4. Bearings: Molded synthetic sleeve, turning in hole in frame.
  5. Finish: Mill galvanized.
  6. Capacity:
    - a. Closed Position: Maximum pressure of 4-inches wg.



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- b. Open Position: Maximum air velocity of 3,000-feet per minute.
- 7. Leakage: Maximum 20 cfm at 4-inches wg.
- 8. Pressure Drop: Maximum 0.02-inch wg at 1,500-feet per minute through 20-inch diameter dampers.
- F. Jackshaft: 1-inch diameter, galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
  - 1. Length and Number of Mountings: Appropriate to connect linkage of each damper in multiple-damper assembly.
  - 2. Damper Hardware: 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. Include center hole to suit damper operating-rod size. Include 2-inch elevated platform for insulated duct mounting.

**2.4 CONCEALED DAMPER HARDWARE**

- A. Manufacturers:
  - 1. Young Regulator Company
- B. Concealed Damper Hardware: For dampers above non-removable ceilings (gyp, plaster, decorative, etc.) where access panels have not been shown on Architectural drawings or in locations where dampers are more than 2-feet above the ceiling, provide:
  - 1. Concealed Damper Regulator: Young Regulator Company Model 315 or approved equivalent.
  - 2. Cable System: Young Regulator Company or approved equivalent.
  - 3. Controller: Young Regulator Company 270-275 or approved equivalent.
  - 4. Control wrenches, wire stops, casing nuts, and stainless steel wire.
  - 5. Paint cover plate to match ceiling color or as directed by Architect.

**2.5 ACCESS DOORS**

- A. Manufacturers:
  - 1. Ductmate
  - 2. Cesco
  - 3. Ruskin
  - 4. Nailor
  - 5. Outdoor Installation: Karp MX insulated exterior access door.



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- B. Duct Pressure Class 2-inch WC and Greater: Sandwich-type design with threaded locking bolt assembly. Closed cell neoprene gasket permanently bonded to inside panel. Zinc-coated steel wing nuts or polypropylene molded knobs with threaded metal inserts - zinc coated bolts sealed to inner panel.
- C. Duct Pressure Class 1-1/2-inch WC and Less: Galvanized steel assembly incorporating frame, door, hinges, and latch(es). Frame tabbed for attachment to duct panel. Double wall door panel with 1-inch insulation. Open cell neoprene gasket attached to frame. Cam latches for tight closure.
- D. Plenum Doors: Extruded aluminum frames with extruded santoprene seals. Double-wall 20 gauge galvanized steel door panel with fiberglass insulation.
- E. Size: Maximum size available to fit rectangular duct panel dimension or round duct diameter. Plenum doors minimum 2-feet wide by 4-feet high.
- F. For outdoor installation, only provide waterproof access doors installed vertically.

**2.6 DUCT TEST HOLES**

- A. Manufacturers:
  - 1. Ventlok
- B. Temporary 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.
- C. Permanent Test Holes (where shown on Drawings): Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

**2.7 TURNING VANES**

- A. Manufacturers:
  - 1. Aerodyne
  - 2. Ductmate Industries
  - 3. Duro Dyno Corp.
  - 4. Metalaire Inc.
- B. Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for vanes and vane runners. Vane runners to automatically align vanes.
- C. Manufactured Turning Vanes: For medium pressure ductwork, ductwork upstream of terminal units, and in ductwork with equal inlet width and height dimensions and outlet width and height dimension, provide double thickness airfoil turning vanes. Low pressure ductwork and ductwork downstream of terminal units use either single thickness or double thickness turning vanes. For mitered rectangular elbows with changes in size from inlet to outlet, only use single thickness turning vanes. Use 2-inch radius vanes spaced



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on centers of 1.5-inches for single thickness. Use 2-inch radius vanes spaced on centers of 2.125-inches for double thickness.

- D. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

**2.8 FLEXIBLE CONNECTORS**

- A. Manufacturers:
  - 1. Duro Dyne Corp.
  - 2. Ventfabrics Inc.
  - 3. Ductmate Industries
  - 4. Hardcast
- B. General Description: Flame-retardant or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.
- C. Metal-Edged Connectors: Factory fabricated with a fabric strip 4-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. Select metal compatible with ducts.
- D. Provide a spring and bracket assembly to reinforce the fabric with sufficient tension to prevent connector collapse under negative or positive pressure. Number and positioning of spring-link fixture to be determined by the manufacturer to maintain straight axis and without kinks between two sections of duct, or between duct and the moving element. Hardcast Spring-Link SL-200, or equal.
- E. Indoor System, Flexible Connector Fabric (FC-I): Glass fabric double coated with neoprene.
  - 1. Minimum Weight: 30 ounces per square yard.
  - 2. Tensile Strength: 395 pounds of force per inch in the warp and 255 pounds of force per inch in the filling.
  - 3. Service Temperature: -40 degrees F to 200 degrees F.
- F. Outdoor System, Flexible Connector Fabric (FC-O): Glass fabric double coated with Hypalon, resistant to UV rays and ozone.
  - 1. Minimum Weight: 26 ounces per square yard.
  - 2. Tensile Strength: 225 pounds of force per inch in the warp and 300 pounds of force per inch in the filling.
  - 3. Service Temperature: -40 degrees F to 200 degrees F.



**PART 3 - EXECUTION**

**3.1 DUCT ACCESSORIES GENERAL INSTALLATION**

- A. Inspect areas to receive air duct accessories. Notify Engineer of conditions that would adversely affect the installation of the dampers. Do not proceed until conditions are corrected.
- B. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts.
- C. Provide duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.
- D. Do not compress or stretch damper frames into duct or opening.
- E. Handle dampers using sleeve or frame. Do not lift dampers using blades, actuators, or jack shafts.
- F. Adjust duct accessories for proper settings.

**3.2 SHEET METAL MATERIALS INSTALLATION**

- A. Install bracing for multiple sections to support assembly weights and hold against system pressure. Install bracing as needed.

**3.3 BACKDRAFT DAMPERS INSTALLATION**

- A. Install backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated. Provide at outside air intakes where motorized dampers are not shown on drawings.

**3.4 DAMPERS INSTALLATION**

- A. Where installing volume dampers in ducts with liner, avoid damage to and erosion of duct liner.
- B. Provide balancing dampers at points on supply, return, and exhaust systems where branches lead from larger ducts for air balancing. Install at a minimum of two duct widths from each branch takeoff. Provide balancing dampers for all air inlets and outlets.
- C. Install dampers square and free from racking with blade running horizontally.

**3.5 CONCEALED DAMPER HARDWARE INSTALLATION**

- A. Coordinate location in Reflected Ceiling Plan and color of concealed damper hardware with Architect prior to installation.

**3.6 ACCESS DOORS INSTALLATION**

- A. Install duct access doors to allow for inspecting, adjusting, and maintaining accessories and terminal units as follows:
  - 1. On both sides of duct coils.
  - 2. Downstream from volume dampers, turning vanes and equipment.
  - 3. Adjacent to fire or smoke dampers, providing access to reset or reinstall fusible links.
  - 4. To interior of ducts for cleaning; before and after each change in direction, at maximum 50-foot (15-m) spacing.
  - 5. Install the following sizes for duct-mounting, rectangular access doors:
    - a. One-Hand or Inspection Access: 8-inches by 5-inches.
    - b. Two-Hand Access: 12-inches by 6-inches.
    - c. Head and Hand Access: 18-inches by 10-inches.
    - d. Head and Shoulders Access: 21-inches by 14-inches.
    - e. Body Access: 25-inches by 14-inches.
    - f. Body Plus Ladder Access: 25-inches by 17-inches.
  - 6. Install the following sizes for duct-mounting, round access doors:
    - a. One-Hand or Inspection Access: 8-inches in diameter.
    - b. Two-Hand Access: 10-inches in diameter.
    - c. Head and Hand Access: 12-inches in diameter.
    - d. Head and Shoulders Access: 18-inches in diameter.
    - e. Body Access: 24-inches in diameter.
  - 7. Label access doors.

**3.7 DUCT TEST HOLES INSTALLATION**

- A. Provide test holes at fan inlets and outlets where indicated and where required for air testing and balancing.

**3.8 TURNING VANES INSTALLATION**

- A. Vanes must be installed, eliminating every other vane is not allowed.



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- B. Single thickness vanes cannot be over 36-inches long without intermediate vane runner.
- C. Install per SMACNA and fasten/support to prevent vibration, noise, and to maintain proper alignment at design velocity.

**3.9 FLEXIBLE CONNECTORS INSTALLATION**

- A. Install flexible connectors immediately adjacent to equipment in ducts associated with fans and motorized equipment supported by vibration isolators. Provide sheet metal weather cover over flexible connections located outdoors. Attach sheet metal to either equipment side or ductwork side, but not both.
- B. Per NFPA, do not use flexible connectors on grease exhaust fans.
- C. Securely attach spring-lock brackets to the metal strips of the connector collar using No. 8 sheet metal screws.
- D. For fans developing static pressures of 5-inch wg and higher, cover flexible connectors with loaded vinyl sheet held in place with metal straps.
- E. Adjust the following types in the following locations:
  - 1. FC-I: Indoors.
  - 2. FC-O: Outdoors.

**END OF SECTION**

**SECTION 23 34 00  
HVAC FANS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Work Included:
  - 1. Roof Exhaust Fans

**1.2 RELATED SECTIONS**

- A. Contents of Division 23, HVAC and Division 01, General Requirements apply to this Section.

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

**1.4 SUBMITTALS**

- A. Submittals as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.
- B. In addition, provide:
  - 1. Certified fan performance curves with system operating conditions indicated.
  - 2. Certified fan sound-power ratings.
  - 3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
  - 4. Material gauges and finishes, including color charts.
  - 5. Dampers, including housings, linkages, and operators.
  - 6. For belt-driven fans, indicate the number of belts provided for design duty.

**1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.
- B. In addition, meet the following:
  - 1. Motors: Premium efficiency. Electrically Commutated Motors (ECM) where scheduled on Drawings.
  - 2. Sound power levels as scheduled on Drawings. If not scheduled, within 5 percent of Basis of Design at design flow.

3. Project Altitude: Base air ratings on sea-level conditions for project sites below 2,000 feet in elevation. Base air ratings on actual site elevations for project sites above 2,000 feet in elevation.
4. Operating Limits: Classify according to AMCA 99.
5. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
6. AMCA Compliance: Products are to comply with performance requirements and are to be licensed to use the AMCA-Certified Ratings Seal.
7. Seismic certification requires each fan to be shake table tested at an independent test facility, to meet an Importance Factor of 1.5, an SDS Value of 2.28, all Site classes, all Occupancy/Risk Categories and all Seismic Design Categories (A-F).
8. NEMA Compliance: Motors and electrical accessories are to comply with NEMA standards.
9. UL Standard: HVAC Fans are to comply with UL 705. Fans used in grease exhaust applications are to be UL 705 - Supplement SC listed for grease exhaust. Fans used for smoke control applications are to be UL 705 - Supplement SD listed for Power Ventilators for Smoke Control.

**1.6 WARRANTY**

- A. Warranty of materials and workmanship as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

**1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver fans as factory-assembled unit, to the extent allowable by shipping limitations, with protective crating and covering.
- B. Disassemble and reassemble units, as required for moving to final location, according to manufacturer's written instructions.
- C. Lift and support units with manufacturer's designated lifting or supporting points.

**1.8 COORDINATION**

- A. Coordinate size and location of structural-steel support members.
- B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases.
- C. Coordinate installation of roof curbs, equipment supports, and roof penetrations.



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**DIVISION 23**

**1.9 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. Belts: One set for each belt-driven unit.

**PART 2 - PRODUCTS**

**2.1 ROOF EXHAUST FANS**

- A. Manufacturers:
1. Greenheck
  2. Cook
  3. Twin City
- B. Description: Belt-driven or direct-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, curb base, and accessories.
- C. Wheel:
1. Single width, single inlet, backward inclined/airfoil blades.
  2. Aluminum hub and wheel with steel inlet bell.
  3. Statically and dynamically balanced with its own bearings.
- D. Housing to match scheduled Basis of Design:
1. One piece heavy gauge spun aluminum dome, hinged for service.
- E. Bearings and Drives:
1. Bearings: Heavy duty pillow block type, self greasing ball bearings with ABMA 9 L-10 life at 100,000 hours.
  2. Shafts: Hot rolled steel, ground and polished, with keyway, protectively coated with lubricating oil.
- F. Pulleys: Cast-iron, adjustable-pitch motor pulley.
- G. Fan and motor isolated from exhaust airstream.
- H. Curb: Prefabricated insulated roof curb, 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, hinged with curb seal. Provide curb for flat, pitched or ridged roof as indicated.
- I. Motor: Integrally mounted, 1800 RPM maximum, with pre-lubricated sealed ball bearings. ODP for motors located indoors and TEFC for motors exposed to moisture.



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HVAC FANS**

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1. Inverter duty motor for use with variable frequency drive where indicated on Fan Schedule on Drawings.
  2. Electrically Commutated Motor (ECM) where indicated on Fan Schedule on Drawings.
- J. Accessories:
1. Inlet/Outlet Screens: Galvanized steel welded grid, removable.
  2. Backdraft Damper: Parallel blade heavy duty steel or aluminum, where scheduled, damper assembly with blades constructed of two plates formed around and welded to shaft, channel frame, sealed ball bearings, with blades linked out of air stream to single control lever. Motorized where indicated and gravity actuated with counterweight, where motorized is not indicated.
  3. Protective coating on fan wheel and interior of fan housing where scheduled. Apply coating before balancing fans and repair any breaks in coating which occur during balancing. One 6-mil coat of white plastic #7122 and one 6-mil coat of black plastic #7122.
  4. Variable-Speed Controller: Where scheduled on Drawings, provide solid-state control to reduce speed from 100 percent to less than 50 percent.
  5. Disconnect Switch: Where not shown on Division 26, Electrical Drawings, provide nonfusable type, with thermal-overload protection mounted inside fan housing factory wired through an internal aluminum conduit.
  6. Vibration Isolation: Wheel and motor mounted on integral double deflection neoprene isolators.

**PART 3 - EXECUTION**

**3.1 GENERAL INSTALLATION REQUIREMENTS**

- A. Install in accordance with manufacturer's instructions.
- B. Install power ventilators level and plumb.
- C. Units using vibration isolation devices are scheduled on Drawings.
- D. Support suspended units from structure threaded steel rods and vibration isolation device scheduled on Drawings.
- E. In seismic zones, restrain support units.
- F. Install units with clearances for service and maintenance.
- G. Provide fixed sheaves required for final air balance.
- H. Provide safety screen where inlet or outlet is exposed.



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- I. Provide backdraft dampers on discharge of exhaust fans and as indicated on Drawings.
- J. Duct installation and connection requirements are specified in other Division 23, HVAC Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors per Section 23 33 00, Air Duct Accessories.
- K. Install ducts adjacent to power ventilators to allow service and maintenance.
- L. Ground equipment.
- M. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- N. Equipment Startup Checks:
  - 1. Verify that shipping, blocking, and bracing are removed.
  - 2. 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.
  - 3. Verify that cleaning and adjusting are complete.
  - 4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
  - 5. Verify lubrication from bearings and other moving parts.
  - 6. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
  - 7. Disable automatic temperature-control operators.
- O. Starting Procedures:
  - 1. Energize motor and adjust fan to indicated rpm.
  - 2. Measure and record voltage and amperage.
- P. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new units, and retest.
- Q. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- R. Shut unit down and reconnect automatic temperature-control operators.



- S. Replace fan and motor pulleys as required to achieve design airflow.
- T. Provide totally enclosed fan cooled motors when motor is located outdoors, whether under a cover or not, or exposed to moisture. Provide protective covering for electronically commutated motors located in outdoor or wet/wash-down locations.
- U. Repair or replace malfunctioning units. Retest as specified above after repairs or replacements are made.
- V. Adjust damper linkages for proper damper operation.
- W. Adjust belt tension.
- X. Lubricate bearings.
- Y. On completion of installation, internally clean fans according to manufacturer's written instructions. Remove foreign material and construction debris. Vacuum fan wheel and cabinet.
- Z. After completing system installation, including outlet fitting and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finishes.
- AA. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain HVAC fans. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining equipment and schedules.

### **3.2 ROOF EXHAUST FANS**

- A. Secure roof exhaust fans to roof curbs with cadmium-plated hardware.

**END OF SECTION**



**SECTION 23 36 00  
AIR TERMINAL UNITS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Work Included:
  - 1. Fan Powered Variable Volume Units

**1.2 RELATED SECTIONS**

- A. Contents of Division 23, HVAC and Division 01, General Requirements apply to this Section.

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

**1.4 SUBMITTALS**

- A. Submittals as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

**1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

**1.6 WARRANTY**

- A. Warranty of materials and workmanship as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Air Terminal Units:
  - 1. Titus
  - 2. Price
  - 3. Krueger
  - 4. Trane
  - 5. Nailor
  - 6. Greenheck



**SECTION 23 36 00  
AIR TERMINAL UNITS**

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**2.2 FAN POWERED VARIABLE VOLUME UNITS**

**A. Basic Assembly:**

1. Casings: Minimum 22 gauge galvanized steel.
2. 1/2-inch dual density insulation which complies with UL 181 and NFPA 90A. Exposed insulation edges to be coated with NFPA 90A approved sealant to prevent entrainment of fibers in the airstream.
3. Engineered polymer foam insulation which complies to UL 181 and NFPA 90A. Insulation to be 1-1/2 pound density, closed cell foam. Exposed fiberglass is not acceptable. The insulation to be mechanically fastened to the unit casing.
4. Non-porous, sealed liner which complies with UL 181 and NFPA 90A. Insulation to be 4-pound density. Cut edges must be sealed from the airstream using mechanically bonded metal barrier strips. Liners made of Mylar, Tedlar, Silane or woven fiberglass cloth are not acceptable.
5. 1-inch thick matte faced insulation, meeting UL 181 and NFPA 90A, enclosed between the unit casing and a non-perforated internal 22 gauge sheet metal cover extending over the fiberglass insulation, as well as covering the liner cut edges.
6. Plenum Air Inlets: Round stub connections or S slip drive connections for duct attachment.
7. Plenum Air Outlets: S slip and drive connections.
8. Casing Leakage: Maximum casing leakage not to exceed 10 cfm at 1.0-inches static pressure for inlet size larger than 12-inch and not to exceed 7 cfm at 1.0-inches static pressure for inlet size 12-inch and smaller.

**B. Basic Unit:**

1. Configuration: Air volume damper assembly and fan in series arrangement inside unit casing. Locate control components inside protective metal shroud.
2. Volume Dampers: Construct of galvanized steel with peripheral gasket and self lubricating bearings; maximum damper leakage: 7 cfm maximum at 3-inches inlet static pressure. Shaft to be clearly marked on the end to indicate damper position. Stickers or other removable markings are not acceptable. the damper to incorporate a mechanical stop to prevent overstroking and a synthetic seal to limit close off leakage to the maximum values shown in the damper leakage table.
3. Removable insulated access panel with quarter turn latches.
4. Flow Sensor: Integral averaging type flow sensor utilizing multiple sensing points with unit mounted calibration chart.
5. Gasketed backdraft damper at fan discharge for series fan configuration.



**SECTION 23 36 00  
AIR TERMINAL UNITS**

**DIVISION 23**

6. Factory mounted filter rack on plenum inlet with 1-inch thick panel filters.
- C. Fan Assembly:
1. Fan: Forward curved centrifugal type with direct drive permanent split capacitor type, thermally protected motor.
  2. Speed Control: Infinitely adjustable with SCR controls.
  3. Isolation: Fan/motor assembly on rubber isolators.
  4. Electrical Characteristics: Reference Drawings.
- D. Maximum primary inlet duct velocity not to exceed 2200 FPM.
- E. Acoustics: Sound power ratings are for fan with outlet static pressure of 0.25-inches wg and 100 percent primary air at 1.5-inches wg inlet static pressure. Sound ratings tested as power level 10-12 watts in accordance with AHRI 880 I-P, not to exceed:
- F. MAXIMUM AIRBORNE SOUND POWER (db)

OCTAVE BAND AND CENTER FREQUENCY (HZ)

CFM	2	3	4	5	6	7
	125	250	500	1K	2K	4K
0-900	72	65	61	63	64	63
901-1400	69	65	64	66	67	64
1401-2000	74	70	66	69	70	65

- G. MAXIMUM RADIATED SOUND POWER (db)

OCTAVE BAND AND CENTER FREQUENCY (HZ)

CFM	2	3	4	5	6	7
	125	250	500	1K	2K	4K
All	74	70	66	63	58	55

- H. Electric Heating Coil:
1. Construction: UL Listed, slip-in type, open coil design, integral control box factory wired and installed with:
    - a. Primary and secondary over-temperature protection.
    - b. Minimum airflow switch.
    - c. Integral door interlock disconnect switch.
    - d. Pneumatic/electric switches and relays.



## SECTION 23 36 00 AIR TERMINAL UNITS

## DIVISION 23

- e. Electrical Characteristics: Reference Drawings.
- I. Wiring Terminations: Wire fan and controls to terminal strip. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials. Enclose terminal lugs in terminal box sized to NFPA 70. Incorporate single-point electrical connection to power source.
  - 1. Disconnect Switch: Factory mount fused disconnect switch in control panel.
- J. DDC Controls: Damper operator, thermostat, and other devices compatible with temperature controls specified in Section 23 09 33, Electric and Electronic Control System for HVAC.
- K. Electric Controls: 24-V damper actuator with wall-mounted electric thermostat and appropriate mounting hardware.

### PART 3 - EXECUTION

#### 3.1 GENERAL INSTALLATION REQUIREMENTS

- A. Install in accordance with manufacturer's instructions. Install level and plumb.
- B. Verify that installation of each air terminal is according to the Contract Documents.
- C. Check that inlet duct connections are as recommended by air terminal manufacturer to achieve proper performance.
- D. Check that controls and control enclosure are accessible.
- E. Verify that control connections are complete.
- F. Check that nameplate and identification tag are visible.
- G. Verify that controls respond to inputs as specified.
- H. Provide ceiling access doors or locate units above easily removable ceiling components.
- I. Support units individually from structure. Do not support from adjacent ductwork.
- J. Provide 9-inch by 9-inch access door with quarter turn latches downstream of each heating coil.
- K. Provide minimum five duct diameters minimum straight duct run upstream of terminal unit.
- L. Minimum of 3-feet straight duct downstream of terminal unit prior to first outlet or first branch duct.
- M. Branch inlet duct size to match unit inlet connection. For branch inlet ducts over 15-feet long, increase branch duct size one size and provide transition immediately upstream of minimum straight duct run.



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- N. Connect to ductwork in accordance with Section 23 31 00, HVAC Ducts and Casings.
- O. Provide minimum of five feet of 1-inch thick lined ductwork downstream of units. Lining to match terminal unit lining type.
- P. Verify that electric power is available and of the correct characteristics.
- Q. Balance unit to air flows scheduled.
- R. Upon completion of installation and prior to initial operation, test and demonstrate that air terminals and duct connection to air terminals are leak tight. Repair or replace air terminals and duct connections as required to eliminate leaks and retest to demonstrate compliance.

**END OF SECTION**

**SECTION 23 37 00  
AIR OUTLETS AND INLETS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Work Included:
  - 1. Grilles, Registers, Diffusers

**1.2 RELATED SECTIONS**

- A. Contents of Division 23, HVAC and Division 01, General Requirements apply to this Section.

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

**1.4 SUBMITTALS**

- A. Submittals as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.
- B. In addition, provide:
  - 1. Data Sheet: For each type of air outlet and inlet, and accessory furnished; indicate construction, finish, and mounting details.
  - 2. Performance Data: Include throw and drop, static-pressure drop, and noise ratings for each type of air outlet and inlet.
  - 3. Schedule of diffusers, registers, and grilles indicating drawing designation, room location, quantity, model number, size and accessories furnished.

**1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.
- B. In addition, meet the following:
  - 1. Air Distribution Diffuser, Register, and Grille Schedule lists Basis of Design, with any specialty accessories, construction, finish or other criteria noted on schedule. Submitted air distribution must match criteria of Basis of Design:
    - a. Construction materials and appearance.
    - b. Frame/installation method.



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- c. Isothermal throw plus or minus 5 percent at design flows shown on drawings.
- d. Noise Criteria: NC value plus or minus 1 at design flows shown on drawings.
- e. Accessories: Equal to Basis of Design.

### 1.6 WARRANTY

- A. Warranty of materials and workmanship as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. General: Manufacturer's standard products of categories and types required for each application as referenced in other Division 23, HVAC sections, where more than a single type is specified for the application, provide single selection for each product category.
- B. Grilles, Registers, Diffusers:
  - 1. Anemostat
  - 2. Carnes
  - 3. Environmental Air Products
  - 4. Krueger
  - 5. Metalaire
  - 6. Nailor
  - 7. Price Co.
  - 8. Shoemaker
  - 9. Titus
  - 10. Tuttle & Bailey
  - 11. Seiho

### 2.2 GRILLES, REGISTERS, DIFFUSERS

- A. Diffuser, Register and Grille Schedule lists Basis of Design, with specialty accessories, construction, finish or other criteria noted on schedule. Submitted air distribution must match criteria of Basis of Design, including accessories and finish:





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1. Matching construction materials and appearance. Equal installation method/frame.
  2. Pressure drop equal to or less than Basis of Design at CFM on Drawings.
  3. Throw: Isothermal jet throw plus or minus 5 percent of Basis of Design at CFM listed on Drawings.
  4. Noise Criteria: Plus or minus 1 NC of Basis of Design at CFM listed on Drawings. If Basis of Design NC is below registered level, submitted must match. NC rating with 10 dB room factor or less.
- B. Provide 1-, 2-, 3-, or 4-way deflection as indicated on Drawings.
- C. Provide pattern controllers for linear supply air diffusers.
- D. Coordinate mounting frames with ceiling construction type. Verify per reflected ceiling plans.

### PART 3 - EXECUTION

#### 3.1 GENERAL INSTALLATION

- A. Install in accordance with manufacturer's instructions. Provide seismic supports, clips, and bracing per local code. Coordinate installation of framing. Provide complete coverage of rough openings by integral device flanges or auxiliary frames. Where above ceiling location is unconditioned space, caulk rough openings; repair and re-paint locations where dust entrainment streaks develop due to unsealed openings.
- B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.
- C. Unless otherwise shown on drawings, for ceiling mounted air outlets with adjustable airflow pattern controllers mounted at a height of 12 feet or less, adjust the air outlets for horizontal air distribution, and adjust to vertical air distribution for ceiling height above 12 feet.
- D. Exterior color of grilles per Architect. White finish if not otherwise scheduled or noted by Architect. Paint ductwork visible behind air outlets and inlets matte black.
- E. Ceiling Membrane: Protect ceiling membrane per code. Fire caulk around openings. Provide listed radiation damper in rated roof/ceiling or floor/ceiling assemblies as required per code.
- F. After installation of diffusers, registers, and grilles, inspect exposed finish. Clean exposed surfaces to remove burrs, dirt, and smudges. Replace diffusers, registers, and grilles that have damaged finishes.

#### 3.2 GRILLES, REGISTERS, DIFFUSERS INSTALLATION

- A. Coordinate with Architectural Reflected Ceiling Plan(s). Reflected ceiling plans determine final locations.



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- B. Install diffusers to ductwork with air tight connection. 18-inch straight duct section or acoustic plenum at connection. Provide square to round adapters where required for connection to round ducts.
- C. Provide integral balancing dampers for diffusers, and grilles and registers where duct manual balancing dampers are not shown or specified.
- D. Linear Slot Diffusers:
  - 1. Coordinate connection plenum dimensions with linear slot final dimensions to conform with manufacturer's recommendations, or as indicated. Total and active lengths as noted on drawings. Blank off unused sections. Coordinate frame type with Architect.
  - 2. Paint surfaces visible behind air outlets and inlets, including blank-off sections, matte black unless otherwise called for on drawings.

**END OF SECTION**

**SECTION 23 40 00  
HVAC AIR CLEANING DEVICES**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Work Included:
  - 1. Extended Surface Pleated Panel Filters
  - 2. High Efficiency Pleated Filters
  - 3. Filter Gauges

**1.2 RELATED SECTIONS**

- A. Contents of Division 23, HVAC and Division 01, General Requirements apply to this Section.
- B. In addition, reference the following:
  - 1. Division 01, General Requirements, Temporary Facilities and Controls: Filters for temporary heating and ventilating.
  - 2. Division 26, Electrical, Equipment Wiring: Electrical characteristics and wiring connections.

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.
- B. In addition, meet the following:
  - 1. ANSI/AHRI 850 I-P - Performance Rating of Commercial and Industrial Air Filter Equipment.
  - 2. ASHRAE Std 52.1 - Gravimetric and Dust-Spot Procedures for Testing Air Cleaning Devices Used in General Ventilation for Removing Particulate Matter; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
  - 3. ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
  - 4. MIL-STD-282 - Filter Units, Protective Clothing, Gas-Mask Components, and Related Products: Performance-Test Methods; Military Specifications and Standards.
  - 5. UL 586 - High Efficiency, Particulate, Air Filter Units; Underwriters Laboratories Inc.



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6. UL 867 - Electrostatic Air Cleaners; Underwriters Laboratories Inc.
7. UL 900 - Standard for Air Filter Units; Underwriters Laboratories Inc.

**1.4 SUBMITTALS**

- A. Submittals as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.
- B. In addition, provide:
  1. Product Data: Provide data on filter media, filter performance data, filter assembly and filter frames, dimensions, motor locations and electrical characteristics and connection requirements.
  2. Shop Drawings: Indicate filter assembly and filter frames, dimensions, motor locations, and electrical characteristics and connection requirements.
  3. Manufacturer's Installation Instructions: Indicate assembly and change-out procedures.
  4. Operation and Maintenance Data: Include instructions for operation, changing, and periodic cleaning.
  5. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
    - a. See Division 01, General Requirements for additional provisions.
    - b. Extra Filters: One set of each type and size.

**1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.
- B. In addition, meet the following:
  1. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

**1.6 WARRANTY**

- A. Warranty of materials and workmanship as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

**1.7 PERFORMANCE REQUIREMENTS**

- A. Conform to ANSI/AHRI 850 I-P - Performance Rating of Commercial and Industrial Air Filter Equipment, Section 7.4.



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1. Dust Spot Efficiency: Plus or minus 5 percent.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

A. Filters:

1. American Filtration Inc.
2. AAF International/American Air Filter/Flanders Corp.
3. Camfil Farr Company
4. Eco-Air Products
5. Filtration Group

B. Filter Gauges:

1. Dwyer Instruments
2. H.O. Treric Co.
3. Weiss Instruments

**2.2 EXTENDED SURFACE PLEATED PANEL FILTERS**

A. Media: 100 percent synthetic, pleated, support grid, enclosed frame, UL 900.

1. Thickness: 2-inch.

B. Performance Rating per ASHRAE Standard 52.2:

1. MERV Rating: 8.
2. Dust Spot Efficiency: 25 to 30 percent.
3. Initial Resistance/Face Velocity: 0.10-inch WG at 300 FPM.
4. Recommended Final Resistance: 1.0-inch WG.

C. Frame: Provide galvanized steel frame, including support hardware with air-tight seal around frame, upstream servicing.

**2.3 HIGH EFFICIENCY PLEATED FILTERS**

A. Media: 100 percent synthetic, pleated, support grid, enclosing frame, UL 900.

1. Thickness: 4-inch.



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- B. Performance Rating per ASHRAE Standard 52.2:
  - 1. MERV 13.
  - 2. Dust Spot Efficiency: 80 to 85 percent.
  - 3. Initial Resistance/Face Velocity: 0.20-inch WG at 500 FPM.
  - 4. Recommended Final Resistance: 1.0-inches WG.
- C. Frame: Provide galvanized steel frame, including support hardware with air tight seal around frame, upstream servicing.

**2.4 FILTER GAUGES**

- A. Direct Reading Dial: 3-1/2-inch diameter diaphragm actuated dial in metal case, vent valves, black figures on white background, front recalibration adjustment, range based on filter's recommended final resistance, 2 percent of full scale accuracy.
- B. Inclined Manometer: One piece molded plastic with epoxy coated aluminum scale, inclined-vertical indicating tube and built-in spirit level, range 0- to 3-inch WG, 3 percent of full scale accuracy.
- C. Accessories: Static pressure tips with integral compression fittings, 1/4-inch aluminum tubing, 2-way or 3-way vent valves.

**PART 3 - EXECUTION**

**3.1 GENERAL INSTALLATION REQUIREMENTS**

- A. Install air cleaning devices in accordance with manufacturer's instructions.
- B. Prevent passage of unfiltered air around filters with felt, rubber, or neoprene gaskets.
- C. Furnish and install filter gauge static pressure tips upstream and downstream of filters. Mount filter gauges on outside of filter housing or filter plenum, in accessible position/location. Adjust and level.
- D. Operation During Construction: If air handlers are operated during construction, provide treated 2-inch media construction filter in front of prefilters and replace periodically to prevent dirt carryover. Install clean prefilters prior to air balancing.
- E. Do not operate fan system until filters (temporary or permanent) are in place. Replace temporary filters used during construction and testing, with clean set.
- F. Provide filter gauges on filter banks, installed with separate static pressure tips upstream and downstream of filters.

**3.2 SCHEDULES**

- A. Air Filter Schedule



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- B. Drawing Code
- C. Location
- D. Type
- E. Number
- F. Size
- G. Air Flow
- H. Face Velocity
- I. Overall Height
- J. Overall Width
- K. Initial Resistance
- L. Final Resistance

**END OF SECTION**

**SECTION 23 74 00  
ROOFTOP PACKAGED AIR CONDITIONING UNITS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Work Included: Materials, installation and testing of roof-mounted, packaged direct expansion air conditioning units in the following configuration:
  - 1. Rooftop Packaged Air Conditioning Units, Constant Volume and Variable Volume (20 tons and larger).

**1.2 RELATED SECTIONS**

- A. Contents of Division 23, HVAC and Division 01, General Requirements apply to this Section.

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.
- B. In addition, meet the following:
  - 1. AHRI 210/240 - Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment.
  - 2. AHRI 270 - Sound Performance Rating of Outdoor Unitary Equipment (with Addendum 1).
  - 3. AHRI 340/360 - Performance Rating of Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment.
  - 4. AHRI 410 - Forced-Circulation Air-Cooling and Air-Heating Coils (with Addenda 1, 2 & 3).
  - 5. AHRI 1060 I-P - Performance Rating of Air-to-Air Exchangers for Energy Recovery Ventilation Equipment.

**1.4 SUBMITTALS**

- A. Submittals as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

**1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.
- B. In addition, meet the following





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1. Interior surfaces of units to meet erosion and growth resistance requirements as well as construction requirements for equipment of ASHRAE 62.1, latest edition.
2. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
3. Fabricate and label refrigeration system to comply with ASHRAE 15, Safety Code for Mechanical Refrigeration.
4. Energy-Efficiency Ratio: Meet minimum requirements shown on Drawings.
5. Coefficient of Performance: Meet minimum requirements shown on Drawings.
6. Comply with NFPA 54 for gas-fired furnace section. Classified in accordance with ANSI Z 21.47.
7. AHRI Certification: Provide AHRI certified and listed units.
8. AHRI Compliance for Units with Capacities Less Than 135,000 Btuh (39.6 kW): Rate rooftop air-conditioner capacity according to AHRI 210/240, Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment.
9. AHRI Compliance for Units with Capacities 135,000 Btuh (39.6 kW) and More: Rate rooftop air-conditioner capacity according to AHRI 340/360, Performance Rating of Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment.
10. Sound Power Level Ratings: Comply with AHRI 270, Sound Performance Rating of Outdoor Unitary Equipment (with Addendum 1).

**1.6 WARRANTY**

- A. Warranty of materials and workmanship as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.
- B. In addition, provide:
  1. Provide total 5 years manufacturer's warranty for compressor(s), including parts and labor.
  2. Provide 5 year manufacturer warranty on heat exchanger.

**1.7 EXTRA MATERIALS**

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  1. Fan Belts: One set for each belt-drive fan.
  2. Filters: One set of filters for each unit.



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**PART 2 - PRODUCTS**

**2.1 ROOFTOP PACKAGED AIR CONDITIONING UNITS, CONSTANT VOLUME AND VARIABLE VOLUME (20 TONS AND LARGER)**

- A. Manufacturers:
  - 1. AAON, Inc.
  - 2. Governair
  - 3. Mammoth
  - 4. Daikin Applied
  - 5. Trane
  - 6. York/JCI
  - 7. Carrier
- B. Description: Factory assembled and tested; designed for exterior installation; consisting of compressor, indoor and outside refrigerant coils, indoor fan and outside coil fan, refrigeration and temperature controls, filters, gas furnace heat exchanger, and dampers.
- C. Casing: Manufacturer's standard galvanized sheet metal construction with exterior enamel paint finish, removable panels or access doors or hinged access doors with neoprene gaskets for inspection and access to internal parts, minimum 3/4-inch thick thermal insulation, perforated-metal liner knockouts for electrical and piping connections, exterior condensate drain connection, and lifting lugs. Finished panel surfaces to withstand a minimum 1000-hour salt spray test in accordance with ASTM B117 standard for salt spray resistance. Unit base to overhang the roof curb for positive water runoff and seat on the roof curb gasket to provide a positive weather tight seal.
- D. Supply Fan: Forward curved or Airfoil, centrifugal, belt driven with Adjustable or Fixed motor sheaves, grease-lubricated ball bearings, and motor with variable frequency drive. Mount fan and motor assembly on base with rubber in shear isolators.
  - 1. Fan assembly to have adjustable pitched sheaves on the motor. Bushings to be used on sheaves to allow for easy removal of the pulleys from the fan and motor shaft. Fixed bore pulleys fastened to the shaft by setscrews will not be allowed. Drives selected with a 1.2 service factor.
  - 2. Fan assemblies statically and dynamically balanced at the factory, including a final trim balance, prior to shipment. Fan assemblies to employ solid steel fan shafts. Bearings sized to provide a L-50 life of 250,000 hours.
  - 3. Provide fan motors heavy-duty, 1800 rpm, open drip-proof (ODP). Motors efficiencies to meet EPAAct premium efficiencies. Motors mounted on an adjustable base that provides for proper alignment and belt tension adjustment.



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4. Fan design to allow for the fan and motor assembly to slide out of the rooftop unit for ease of servicing the equipment.
- E. Outside Coil Fan: Condenser fans to be direct drive, axial type designed for low tip speed and vertical air discharge. Condenser fan rpm: 1140 rpm maximum. Fan blades constructed of steel and riveted to a steel center hub. Condenser fan motors to be heavy-duty, non-reversing type with permanently lubricated ball bearing and thermal protection. Motor design to be totally enclosed air over (TEAO) to protect the motors from rain and damage by water.
- F. Refrigerant Coils: Aluminum or Copper fin and seamless copper tube in galvanized-steel casing with equalizing-type vertical distributor and thermal expansion valve; tested to 450 PSIG (3105 kPa) and leak tested to 300 PSIG (2070 kPa) with air under water. Insulate coil section. Provide phenolic epoxy corrosion-protection coating to both coils. Coils to be factory leak tested with high pressure air under water. Condenser coils to be protected from incidental contact to coil fins by a coil guard.
- G. Compressor(s): Number as scheduled hermetic reciprocating, hermetic scroll, semihermetic reciprocating, and screw compressors with integral vibration isolators, internal overcurrent and overtemperature protection, internal pressure relief, and crankcase heater(s).
- H. Refrigeration System:
  1. R-454B refrigerant.
  2. Compressor(s).
  3. Outside coil and fan.
  4. Indoor coil and fan.
  5. Check valves.
  6. Expansion valves with replaceable thermostatic elements.
  7. Refrigerant dryers.
  8. High-pressure switches.
  9. Low-pressure switches.
  10. Thermostats for coil freeze-up protection during low-ambient temperature operation or loss of air.
  11. Independent refrigerant circuits.
  12. Brass service valves installed in discharge and liquid lines.
  13. Charge of refrigerant.



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14. Timed Off Control: Automatic-reset control shuts compressor off after five minutes.
  15. Refrigerant Circuits: Interlaced refrigerant-coil circuiting with circuit for each compressor.
  16. Capacity Control: Cylinder unloaders with steps as scheduled.
  17. Capacity Control: Hot-gas bypass valve and piping on lead compressor.
  18. Compressor Motor Overload Protection: Manual reset.
  19. Antirecycling Timing Device: Prevents compressor restart for five minutes after shutdown.
  20. Adjustable, Low-Ambient, Head-Pressure Control: Designed to operate at temperatures as low as 0 deg F (minus 18 deg C) by cycling outside coil fans and controlling speed of last fan of each circuit.
  21. Oil-Pressure Switch: Designed to shut down compressors on low oil pressure.
  22. Drain Pan: Stainless steel, positively sloped drain pan provided with the cooling coil. Drain pan to extend beyond the leaving side of the coil and underneath the cooling coil connections. Drain pan to have a minimum slope of 1/8-inch per foot to provide positive draining. The slope of the drain pan to be in two directions and comply with ASHRAE Standard 62.1. Drain pan to be connected to a threaded drain connection extending through the unit base.
- I. Filters: 4-inch thick, fiberglass, pleated throwaway filters in filter rack.
- J. Outdoor/Return Air Section: A return air plenum to be provided with an outdoor air hood. Hood to allow outdoor air to enter at the back of the return air plenum. Hood to include moisture eliminator filters to drain water away from the entering air stream. Return air plenum to allow return air to enter from the bottom of the unit. Upon unit shut down during unoccupied periods, the outdoor air damper to be power driven closed.
- K. Economizer: Return- and outside-air dampers with neoprene seals, outside-air filter, and hood. Damper blades to be gasketed with side seals and jamb seals to provide an air leakage rate of no more than 4 cfm/square foot of damper area at 1-inch differential pressure per ASHRAE 90.1 Energy Standard. leakage rate to be tested in accordance with AMCA Standard 500. Upon unit shut down during unoccupied periods the outdoor air damper to be power driven closed.
1. Damper Motor: Fully modulating spring return with adjustable minimum position.
  2. Control: Electronic-control system uses outside-air temperature, mixed-air and outside-air temperature, outside air enthalpy, or mixed-air temperature and selects between outside-air and return-air enthalpy to adjust mixing dampers.
  3. Relief Damper: Gravity actuated with bird screen and hood.
  4. Low-leakage dampers with 1 percent leakage are optional.



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5. Leakage: Maximum leakage 2.5 percent at nominal airflow of 400 cfm per ton (54 L/s per kW) with 1-inch wg (250-Pa) pressure differential.
- L. Power Connection: Provide for single connection of power to unit with unit-mounted disconnect switch accessible from outside unit and control-circuit transformer with built-in circuit breaker.
- M. Unit wiring to comply with NEC requirements and with applicable UL standards. Electrical components to be UL recognized where applicable. Wiring and electrical components provided with the unit to be number and color coded and labeled according to the electrical diagram provided for easy identification. The unit to be provided with a factory wired weatherproof control panel. Unit to have a single point power connection for main power connection. A terminal board to be provided for low voltage control wiring. Each compressor and condenser fan motor to be furnished with contactors and thermal overload protection. Supply fan motors to have a factory installed and wired control contactor. Knockouts to be provided in the bottom of the main control panels for field wiring entrance.
- N. Unit Controls: Solid-state control board and components contain at least the following features:
  1. Indoor fan on/off delay.
  2. Default control to ensure proper operation after power interruption.
  3. Service relay output.
  4. Unit diagnostics and diagnostic code storage.
  5. Field-adjustable control parameters.
  6. Dehumidification control with dehumidistat.
  7. Economizer control.
  8. Indoor-air quality control with carbon dioxide sensor. Locate in main return air duct.
  9. Low-ambient control, allowing operation down to 0 deg F (minus 18 deg C).
  10. Minimum run time.
  11. Night setback mode.
  12. Return-air temperature limit.
  13. Smoke alarm with smoke detector installed in return air.
  14. Low-refrigerant pressure control.



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15. Digital display of outside temperature, supply-air temperature, return-air temperature, economizer damper position, indoor-air quality, and control parameters.
  16. Variable-Air-Volume Control: Modulating damper operator operating variable-inlet-fan vanes or Variable-frequency drive controls supply-air static pressure. Supply-air, static-pressure limit shuts unit down on high pressure.
- O. DDC Temperature Control: Install stand-alone control module providing link between unit controls and DDC temperature-control system through BACnet, Lon Works, or Modbus interface. Coordinate points to be passed and sequences of operation with Drawings and Section 23 09 33, Electric and Electronic Control System for HVAC. Coordinate exact location with owner.
- P. Optional Accessories:
1. Service Outlets: One, 115-V, ground-fault, circuit-interrupter type.
  2. PVC or Copper condensate drain trap.
  3. Dirty-filter switch.
- Q. Roof Curb:
1. Steel with corrosion-protection coating, gasketing, and factory-installed wood nailer; complying with NRCA standards; minimum height of 14-inches.
  2. Isolation Curb: Rigid upper and lower steel structure with vibration isolation springs having 2-inch static deflection and vertical and horizontal restraints; with elastomeric waterproof membrane.
  3. Insulate the interior of the curb with 2-inches of 1.5 pound neoprene coated fiberglass insulation.
  4. Provide seismic restraints to secure the unit to the curb in accordance with code.

## PART 3 - EXECUTION

### 3.1 GENERAL INSTALLATION REQUIREMENTS

- A. Examine areas and conditions under which units are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.
- B. Roof curb to be mounted level on roof in accordance to NRCA manuals and details. Secure to structure per engineered/sealed seismic installation details.
- C. Unit to be secured to curb per seismic installation details.
- D. Provide external vibration isolation or isolation curb to prevent transmission of unit-borne sound and vibration to building structure. Provide flexible connections for hot water piping, electrical power and fuel piping.



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- E. Seal openings between curb, roof opening, ducts, electrical conduits, piping, and building interior.
- F. Protect the roof from damage during installation. Secure factory touch-up paint to repair scratches and minor damage to equipment prior to start-up. Comb evaporator and condenser coils to repair any minor fin damage.
- G. Control wiring from roof-mounted equipment must be routed in conduit from above roof to inside building or must be routed through roof curb inside unit. Control wiring must not be exposed to weather.
- H. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.
- I. Perform the following field quality-control tests and inspections and prepare test reports:
  - 1. After installing rooftop air conditioners 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.
- J. Remove malfunctioning units, replace with new units, and retest as specified above.
- K. Engage a factory-authorized service representative to perform startup service.
- L. Protect or remove energy recovery devices prior to starting the units to ensure damage does not occur to the devices or media. Replace at no cost to Owner if devices/media get damaged or are no longer in "as-new" condition.
- M. Complete installation and startup checks according to manufacturer's written instructions and do the following:
  - 1. Inspect for visible damage to unit casing.
  - 2. Inspect for visible damage to compressor, air-cooled outside coil, energy recovery devices, internal coils, and fans.
  - 3. Inspect internal insulation.
  - 4. Verify that labels are clearly visible.
  - 5. Verify that clearances have been provided for servicing.
  - 6. Verify that controls are connected and operable.



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7. Verify that filters are installed.
8. Clean outside coil and inspect for construction debris.
9. Adjust vibration isolators.
10. Inspect operation of barometric dampers.
11. Lubricate bearings on fan.
12. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.
13. Adjust fan belts to proper alignment and tension.
14. Start unit according to manufacturer's written instructions.
  - a. Coordinate starting of refrigeration system during winter with manufacturer.
  - b. 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 outside-air dampers for proper stroke and interlock with return-air dampers.
20. Start refrigeration system and measure and record the following:
  - a. Coil leaving-air, dry- and wet-bulb temperatures.
  - b. Coil entering-air, dry- and wet-bulb temperatures.
  - c. Outside-air, dry-bulb temperature.
  - d. Outside-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.





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- b. Return-air volume.
  - c. Relief-air volume.
  - d. Outside-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 outside coil or from outside coil to outside-air intake.
- 24. Verify operation of remote panel, including pilot-light operation and failure modes. Inspect the following:
  - a. High-limit heat exchanger.
  - b. Warm-up for morning cycle.
  - c. Freezestat operation.
  - d. Economizer to limited outside-air changeover.
  - e. Alarms.
- 25. After startup and performance testing, change filters, vacuum heat exchanger and cooling and outside coils, lubricate bearings, adjust belt tension, and inspect operation of power vents.
- N. Adjust initial temperature set points.
- O. Set field-adjustable switches and circuit-breaker trip ranges as indicated.
- P. Occupancy Adjustments: Within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to site outside normal occupancy hours for this purpose, without additional cost.
- Q. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain rooftop air conditioners. Reference Division 01, General Requirements.

**3.2 ROOFTOP PACKAGED AIR CONDITIONING UNITS, CONSTANT VOLUME AND VARIABLE VOLUME (20 TONS AND LARGER) INSTALLATION**

- A. Duct installation requirements are specified in other Division 23, HVAC Sections. Drawings indicate the general arrangement of ducts. The following are specific connection requirements:
  - 1. Install ducts to termination in roof curb.



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2. Remove roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.
  3. Terminate return-air duct through roof structure.
  4. Fill void between roof and bottom of unit with 3-pound density acoustic batt.
  5. Install normal-weight, 3000 PSI (20.7 MPa), compressive strength (28-day) concrete mix inside roof curb, 4-inches thick.
- B. Electrical System Connections: Comply with applicable requirements in Division 26, Electrical Sections for power wiring, switches, and motor controls.
- C. Ground equipment according to Division 26, Electrical.
- D. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

**END OF SECTION**

**SECTION 23 81 43  
AIR SOURCE HEAT PUMPS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Work Included:
  - 1. Ductless Split System Heat Pump Units

**1.2 RELATED SECTIONS**

- A. Contents of Division 23, HVAC and Division 01, General Requirements apply to this Section.

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

**1.4 SUBMITTALS**

- A. Submittals as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

**1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.
- B. In addition, meet the following:
  - 1. AHRI 210/240 - Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment.
  - 2. AHRI 270 - Sound Performance Rating of Outdoor Unitary Equipment (with Addendum 1).
  - 3. NRCA: Provide roof curbs in accordance with NRCA.

**1.6 WARRANTY**

- A. Warranty of materials and workmanship as outlined in Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.
- B. In addition, provide:
  - 1. Refrigeration Compressor(s): 5-year warranty.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

A. Ductless Split System Heat Pump Units:

1. Mitsubishi Electric
2. Daikin Applied
3. Sanyo
4. LG
5. Friedrich

**2.2 DUCTLESS SPLIT SYSTEM HEAT PUMP UNITS**

- A. General: The heat pump air conditioning system is a dual split type system. The system to consist of a slim silhouette, compact wall-mounted packaged evaporator with integral booster heater and matching Slim Line air cooled outdoor unit. The units listed by Electrical Testing Laboratories (ETL) and bear the ETL label. Wiring to be in accordance with the NEC. Rate the units in accordance with AHRI 210/240 and bear the AHRI label. Provide a full charge of R-410a or R-134 for 25-feet of refrigerant tubing in the condensing units. Provide a holding charge in the evaporator.
- B. Performance: See Equipment Schedule on Drawings for performances/capacities.
- C. Indoor Unit: Completely factory assembled and wired. The evaporator fan forward curve line flow fan direct driven by a single motor. The fans statically and dynamically balanced and run on permanently lubricated bearings.
1. Provide a manually adjustable change vane. The vane to have the ability to direct the air flow from horizontal to vertical.
  2. The evaporator coil of nonferrous construction with smooth plate fins bonded to copper tubing. The tubing to have inner grooves for high efficiency heat exchange. Braze tube joints with phos-copper or silver alloy. Pressure test the coils at the factory. Provide a condensate pan with drain under the coil. The unit powered from the outdoor unit.
  3. Provide external condensate pump.
  4. System Control: The control system for each indoor unit to consist of two microprocessors interconnected by a multiwire cable. One microprocessor factory wired and located within the indoor unit. It to have the capability of sensing return air temperature and indoor coil temperature; receive and process commands from the remote controller; control the booster heater; and control the outdoor unit. Simultaneous operation possible only when both units are in the same mode.

5. The microprocessor within the wall-mounted remote controller to sense room temperature; display setpoint and room temperature; provide two manually selected modes of cooling, normal and economy operation at 2 degrees F above setpoint; provide manual heating selection; provide continuous or automatic start/stop of system operation; night setback operation of 4 degrees F above setpoint for cooling and 4 degrees F below setpoint for heating; and manual or automatic fan speed control. Base automatic fan speed control upon the temperature difference between setpoint and room temperature maintaining lowest speed possible.
  6. Control the heating system so that only warm air is discharged at the start of the heating cycle and during defrost. The booster heater to come on line only when the difference between the setpoint and room temperature exceeds 5.4 degrees F. Heating switched back to the heat pump only when the difference drops back to less than 3.6F.
- D. Outdoor Coil Defrost Control: Function on the basis of time and coil temperature. Timer to actuate a defrost mode if coil temperature is low enough to indicate frost condition. Defrost termination time maximum 10 minutes or when the defrost thermostat is satisfied. Electric resistance heaters operational automatically during the defrost cycle.
- E. Provide automatic defrost controls that operate during heating, only when temperatures are below 36 degrees F, set to minimize energy use.

### **PART 3 - EXECUTION**

#### **3.1 GENERAL INSTALLATION REQUIREMENTS**

- A. Examine areas and conditions under which units are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.
- B. Verify that ceiling system is ready to receive work and opening dimensions are as indicated on shop drawings.
- C. Verify that electric power is available and of the correct characteristics.
- D. Install in accordance with manufacturers written instructions and guidelines.
- E. Coordinate installation of unit with building components to allow adequate airflow to/from the units and for maintenance clearances. Mount outdoor units on a concrete housekeeping pad if on grade, or on a built-up roofing curb flashed and sealed in accordance with roofing warranty requirements.
- F. Provide adequate bracing and vibration isolation in accordance with seismic code requirements and acoustical engineers requirement.
- G. Provide adequate drainage connections and routing for condensate piping to indirect waste receiver.
- H. Provide shut off valves, site glasses, and routing pressure gauges, and all other appurtenances required for refrigerant system maintenance and operation.



**SECTION 23 81 43  
AIR SOURCE HEAT PUMPS**

**DIVISION 23**

- I. Provide filters for indoor units. Where outdoor units are installed, within 20-feet of trees, flowers plants, animals or other pollen or dander producing items, provide filters for outdoor units.
- J. Set initial temperature set points. Instruct operating personnel in adjustment of setpoints and controls.
- K. See Division 01, General Requirements and Section 23 00 00, HVAC Basic Requirements for additional requirements.
- L. Provide service and maintenance of units for one year from date of substantial completion.
- M. Furnish to Owner, with receipt, for each packaged heating and cooling unit:
  - 1. One set matched fan belts for each belt-driven fan.
  - 2. One set filters for each unit.

**END OF SECTION**

**SECTION 26 00 00  
ELECTRICAL BASIC REQUIREMENTS**

**PART 1 - GENERAL**

**1.1 SECTION INCLUDES**

- A. Work included in 26 00 00, Electrical Basic Requirements applies to Division 26, Electrical work to provide materials, labor, tools, permits, incidentals, and other services to provide and make ready for Owner's use of electrical systems for proposed project.
- B. Contract Documents include, but are not limited to, Specifications including Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Drawings, Addenda, Owner/Architect Agreement, and Owner/Contractor Agreement. Confirm requirements before commencement of work.
- C. Definitions:
  - 1. Provide: To furnish and install, complete and ready for intended use.
  - 2. Furnish: Supply and deliver to project site, ready for unpacking, assembly and installation.
  - 3. Install: Includes unloading, unpacking, assembling, erecting, installation, applying, finishing, protecting, cleaning and similar operations at project site as required to complete items of work furnished.
  - 4. Approved or Approved Equivalent: To possess the same performance qualities and characteristics and fulfill the utilitarian function without any decrease in quality, durability or longevity. For equipment/products defined by the Contractor as "equivalent", substitution requests must be submitted to Engineer for consideration, in accordance with Division 01, General Requirements, and approved by the Engineer prior to submitting bids for substituted items.
  - 5. Authority Having Jurisdiction (AHJ): Indicates reviewing authorities, including local fire marshal, Owner's insurance underwriter, Owner's Authorized Representative, and other reviewing entity whose approval is required to obtain systems acceptance.

**1.2 RELATED SECTIONS**

- A. Contents of Section applies to Division 26, Electrical Contract Documents.
- B. Related Work:
  - 1. Additional conditions apply to this Division including, but not limited to:
    - a. Specifications including Division 00, Procurement and Contracting Requirements and Division 01, General Requirements.
    - b. Drawings
    - c. Addenda



**SECTION 26 00 00  
ELECTRICAL BASIC  
REQUIREMENTS**

**DIVISION 26**

- d. Owner/Architect Agreement
- e. Owner/Contractor Agreement
- f. Codes, Standards, Public Ordinances and Permits

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards per Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, individual Division 26, Electrical Sections and those listed in this Section.
- B. Codes to include latest adopted editions, including current amendments, supplements and local jurisdiction requirements in effect as of the date of the Contract Documents, of/from:
  - 1. State of California:
    - a. CALGreen - California Green Building Standards Code (CCR, Title 24, Part 11)
    - b. CBC - California Building Code
    - c. CEC - California Electrical Code
    - d. CEC T24 - California Energy Code Title 24
    - e. CFC - California Fire Code
    - f. CMC - California Mechanical Code
    - g. CPC - California Plumbing Code
    - h. CSFM - California State Fire Marshal
- C. Reference standards and guidelines include but are not limited to the latest adopted editions from:
  - 1. ABA - Architectural Barriers Act
  - 2. ADA - Americans with Disabilities Act
  - 3. ANSI - American National Standards Institute
  - 4. APWA - American Public Works Association
  - 5. ASCE - American Society of Civil Engineers
  - 6. ASHRAE Guideline 0, the Commissioning Process
  - 7. ASTM - ASTM International





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8. CFR - Code of Federal Regulations
9. EPA - Environmental Protection Agency
10. ETL - Electrical Testing Laboratories
11. FCC - Federal Communications Commission
12. FM - FM Global
13. IBC - International Building Code
14. IEC - International Electrotechnical Commission
15. IEEE - Institute of Electrical and Electronics Engineers
16. IES - Illuminating Engineering Society
17. ISO - International Organization for Standardization
18. MSS - Manufacturers Standardization Society
19. NEC - National Electric Code
20. NECA - National Electrical Contractors Association
21. NEMA - National Electrical Manufacturers Association
22. NETA - National Electrical Testing Association
23. NFPA - National Fire Protection Association
24. OSHA - Occupational Safety and Health Administration
25. UL - Underwriters Laboratories Inc.

D. See Division 26, Electrical individual Sections for additional references.

**1.4 SUBMITTALS**

- A. See Division 01, General Requirements for Submittal Procedures as well as individual Division 26, Electrical Sections.
- B. Provide drawings in format and software release equal to the design documents. Drawings to be the same sheet size and scale as the Contract Documents.
- C. In addition:
  1. "No Exception Taken" constitutes that review is for general conformance with the design concept expressed in the Contract Documents for the limited purpose of checking for conformance with information given. Any action is subject to the requirements of the Contract Documents. Contractor is responsible for the



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dimensions and quantity and will confirm and correlate at the job site, fabrication processes and techniques of construction, coordination of the work with that of all other trades, and the satisfactory performance of the work.

2. Provide product submittals and shop drawings in electronic format only. Electronic format must be submitted via zip file via e-mail. For electronic format, provide one file per division containing one bookmarked PDF file with each bookmark corresponding to each Specification Section. Provide a table of contents identifying the products being submitted for each specification section. Arrange bookmarks in ascending order of Specification Section number. Individual submittals sent piecemeal in a per Specification Section method will be returned without review or comment. All transmissions/submissions to be submitted to Architect. Deviations will be returned without review.
  - a. Provide separate submittals for power system study (per Specification Section 26 05 73) and electrical equipment (for example, switchboards and panelboards).
  - b. Provide separate submittals for lighting control cutsheets, and for lighting control shop drawings.
3. Product Data: Provide manufacturer's descriptive literature for products specified in Division 26, Electrical Sections.
4. Identify/mark each submittal in detail. Note what differences, if any, exist between the submitted item and the specified item. Failure to identify the differences will be considered cause for disapproval. If differences are not identified and/or not discovered during the submittal review process, Contractor remains responsible for providing equipment and materials that meet the Specifications and Drawings.
  - a. Label submittal to match numbering/references as shown in Contract Documents. Highlight and label applicable information to individual equipment or cross out/remove extraneous data not applicable to submitted model. Clearly note options and accessories to be provided, including field installed items. Highlight connections by/to other trades.
  - b. Include technical data, installation instructions and dimensioned drawings for products, fixtures, equipment and devices installed, furnished or provided. Reference individual Division 26, Electrical specification Sections for specific items required in product data submittal outside of these requirements.
  - c. See Division 26, Electrical individual Sections for additional submittal requirements outside of these requirements.
5. Maximum of two reviews of complete submittal package. Arrange for additional reviews and/or early review of long-lead items; bear costs of these additional reviews at Engineer's hourly rates. Incomplete submittal packages/submittals will be returned to contractor without review.



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6. Structural/Seismic: Provide weights, dimensions, mounting requirements and like information required for mounting, seismic bracing, and support. Indicate manufacturer's installation and support requirements to meet ASCE 7-16 requirements for non-structural components. Provide engineered seismic drawings and equipment seismic certification. Equipment Importance Factor as specified in Division 01 and in Structural documents.
7. Trade Coordination: Include physical characteristics, electrical characteristics, device layout plans, wiring diagrams, and connections as required per Division 26, Electrical Coordination Documents. For equipment with electrical connections, furnish copy of approved submittal for inclusion in Division 26, Electrical submittals. Electric motors are supplied and installed by Division 23 unless otherwise specified. During shop drawing stage of the project, verify correct disconnect sizes, conductor sizes, etc., and bring any discrepancies to the attention of the Mechanical trade. Be responsible for any modifications to electrical equipment or installations as a result of equipment incompatibility discovered after shop drawing review.
8. Make provisions for openings in building for admittance of equipment prior to start of construction or ordering of equipment.
9. Substitutions and Variation from Basis of Design:
  - a. The Basis of Design designated product establishes the qualities and characteristics for the evaluation of any comparable products by other listed acceptable manufacturers if included in this Specification or included in an approved Substitution Request as judged by the Design Professional.
  - b. If substitutions and/or equivalent equipment/products are being proposed, it is the responsibility of parties concerned, involved in, and furnishing the substitute and/or equivalent equipment to verify and compare the characteristics and requirements of that furnished to that specified and/or shown. If greater capacity and/or more materials and/or more labor is required for the rough-in, circuitry or connections than for the item specified and provided for, then provide compensation for additional charges required for the proper rough-in, circuitry and connections for the equipment being furnished. No additional charges above the Base Bid, including resulting charges for work performed under other Divisions, will be allowed for such revisions. Coordinate with the requirements of "Submittals." For any product marked "or approved equivalent," a substitution request must be submitted to Engineer for approval prior to purchase, delivery or installation.
10. Shop Drawings: Provide coordinated shop drawings which include physical characteristics of all systems, device layout plans, and control wiring diagrams. Reference individual Division 26, Electrical specification Sections for additional requirements for shop drawings outside of these requirements.
  - a. Provide Shop Drawings indicating access panel locations, size and elevation for approval prior to installation.
11. Samples: Provide samples when requested by individual Sections.



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**12. Resubmission Requirements:**

- a. Make corrections or changes in submittals as required in response to Engineer's comments. Provide a cover letter with resubmittal that includes responses to each of the Engineer's submittal review comments and identifies changes in the resubmittal. Cloud changes in the submittals.
  - 1) Resubmit for review until review indicates "no exception taken" or "make corrections noted."
  - 2) When submitting drawings for Engineer's re-review, clearly indicate changes on drawings and cloud any revisions. Submit a list describing each change.

**13. Operation and Maintenance Manuals, Owner's Instructions:**

- a. Submit, at one time, electronic files (PDF format) of manufacturer's operation and maintenance instruction manuals and parts lists for equipment or items requiring servicing. Submit data when work is substantially complete and in same order format as submittals. Include name and location of source parts and service for each piece of equipment.
  - 1) Include copy of approved submittal data along with submittal review letters received from Engineer. Data to clearly indicate installed equipment model numbers. Delete or cross out data pertaining to other equipment not specific to this project.
  - 2) Include copy of manufacturer's standard Operations and Maintenance for equipment. At front of each tab, provide routine maintenance documentation for scheduled equipment. Include manufacturer's recommended maintenance schedule and highlight maintenance required to maintain warranty. Furnish list of routine maintenance parts, including part numbers, sizes, quantities, relevant to each piece of equipment.
  - 3) Include Warranty per Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 26 00 00, Electrical Basic Requirements and individual Division 26, Electrical Sections.
  - 4) Include product certificates of warranties and guarantees.
  - 5) Include copy of complete parts list for equipment. Include available exploded views of assemblies and sub assemblies.
  - 6) Include copy of startup and test reports specific to each piece of equipment.
  - 7) Engineer will return incomplete documentation without review. Engineer will provide one set of review comments in Submittal



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Review format. Contractor must arrange for additional reviews; Contractor to bear costs for additional reviews at Engineer's hourly rates.

- b. Thoroughly instruct Owner in proper operation of equipment and systems. Where noted in individual Sections, training will include classroom instruction with applicable training aids and systems demonstrations. Field instruction per Section 26 00 00, Electrical Basic Requirements, Demonstration.
- c. Copies of certificates of code authority inspections, acceptance, code required acceptance tests, letter of conformance and other special guarantees, certificates of warranties, specified elsewhere or indicated on Drawings.

### 14. Record Drawings:

- a. Maintain at site at least one set of drawings for recording "As-constructed" conditions. Indicate on drawings changes to original documents by referencing revision document, and include buried elements, location of conduit, and location of concealed electrical items. Include items changed by field orders, supplemental instructions, and constructed conditions.
- b. Record Drawings are to include equipment and fixture/connection schedules that accurately reflect "as constructed or installed" for project.
- c. At completion of project, input changes to original project on CAD Drawings and make one set of black-line drawings created from CAD Files in version/release equal to contract drawings. Submit CAD Files and drawings upon substantial completion.
- d. Record drawings solely referencing field orders, supplemental instructions, etc. without any revision markups based on the change responses are not acceptable.
- e. See Division 26, Electrical individual Sections for additional items to include in record drawings.

## 1.5 QUALITY ASSURANCE

- A. Regulatory Requirements: Work and materials installed to conform with all local, State and Federal codes, and other applicable laws and regulations. Where code requirements are at variance with Contract Documents, meet code requirements as a minimum requirement and include costs necessary to meet these in Contract. Machinery and equipment are to comply with OSHA requirements, as currently revised and interpreted for equipment manufacturer requirements. Install equipment provided per manufacturer recommendations.
- B. Whenever this Specification calls for material, workmanship, arrangement or construction of higher quality and/or capacity than that required by governing codes, higher quality and/or capacity take precedence.



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- C. Drawings are intended to be diagrammatic and reflect the Basis of Design manufacturer's equipment. They are not intended to show every item in its exact dimensions, or details of equipment or proposed systems layout. Verify actual dimensions of systems (i.e. distribution equipment, duct banks, light fixtures, etc.) and equipment proposed to assure that systems and equipment will fit in available space. Contractor is responsible for design and construction costs incurred for equipment other than Basis of Design, including, but not limited to, architectural, structural, electrical, HVAC, fire sprinkler, and plumbing systems.
- D. Manufacturer's Instructions: Follow manufacturer's written instructions. If in conflict with Contract Documents, obtain clarification. Notify Engineer/Architect, in writing, before starting work.
- E. Items shown on Drawings are not necessarily included in Specifications or vice versa. Confirm requirements in all Contract Documents.
- F. Making, supervising, or directing the making of an electrical installation which does not meet minimum safety standards is not allowed.
- G. Except as authorized by the Authority Having Jurisdiction, do not remove, transfer, alter or otherwise tamper with an inspection permit, label, tag or other indicia of inspection placed on or at an electrical job site, electrical installation or electrical product.

**1.6 WARRANTY**

- A. Provide written warranty covering the work for a period of one year from date of Substantial Completion in accordance with Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 26 00 00, Electrical Basic Requirements and individual Division 26, Electrical Sections.
- B. Sections under this Division can require additional and/or extended warranties that apply beyond basic warranty under Division 01, General Requirements and the General Conditions. Confirm requirements in all Contract Documents.

**1.7 COORDINATION DOCUMENTS**

- A. Prior to construction, prepare and submit coordinated layout drawings (composite drawings), to coordinate installation and location of HVAC equipment, ductwork, grilles, diffusers, piping, plumbing equipment/fixtures, fire sprinklers, plumbing, lights, cable tray and electrical services with architectural and structural requirements, and other trades (including plumbing, fire protection, electrical, ceiling suspension, and tile systems), and provide maintenance access requirements. Coordinate with submitted architectural systems (i.e roofing, ceiling, finishes) and structural systems as submitted, including footings and foundation. Identify zone of influence from footings and ensure systems are not routed within the zone of influence.
- B. Coordination drawings to be provided for the following systems, at a minimum, for review and approval:
  - 1. Routing of Raceways and Boxes
  - 2. Switchgear/Switchboards



## **SECTION 26 00 00 ELECTRICAL BASIC REQUIREMENTS**

### **DIVISION 26**

3. Panelboards
4. Central Lighting Inverter
5. Lighting
- C. Prepare Drawings as follows:
  1. Drawings in CAD Format. CAD format release equal to design documents. Drawings to be same sheet size and scale as Contract Drawings and indicate location, size and elevation above finished floor of equipment and distribution systems.
  2. Review and revise, as necessary, section cuts in Contract Drawings after verification of field conditions.
  3. Incorporate Addenda items and change orders.
  4. Provide additional coordination as requested by other trades.
- D. Advise Architect in event conflict occurs in location or connection of equipment. Bear costs resulting from failure to properly coordinate installation or failure to advise Architect of conflict.
- E. Verify in field exact size, location, and clearances regarding existing material, equipment and apparatus, and advise Architect of discrepancies between that indicated on Drawings and that existing in field prior to installation related thereto.
- F. Submit final Coordination Drawings with changes as Record Drawings at completion of project.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Articles, fixtures, and equipment of a kind to be standard product of one manufacturer.

### **2.2 STANDARDS OF MATERIALS AND WORKMANSHIP**

- A. Base contract upon furnishing materials as specified. Materials, equipment, and fixtures used for construction are to be new, latest products as listed in manufacturer's printed catalog data and are to be UL or ETL listed and labeled or be approved by State, County, and City authorities prior to procurement and installation.
- B. Names and manufacturer's names denote character and quality of equipment desired and are not to be construed as limiting competition.
- C. Hazardous Materials:
  1. Comply with local, State of California, and Federal regulations relating to hazardous materials.



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2. Comply with Division 00, Procurement and Contracting Requirements and Division 01, General Requirements for this project relating to hazardous materials.
3. Do not use any materials containing a hazardous substance. If hazardous materials are encountered, do not disturb; immediately notify Owner and Architect. Hazardous materials will be removed by Owner under separate contract.

**PART 3 - EXECUTION**

**3.1 ACCESSIBILITY AND INSTALLATION**

- A. Confirm Accessibility and Installation requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 26 00 00, Electrical Basic Requirements and individual Division 26, Electrical Sections.
- B. Install equipment requiring access (i.e., junction boxes, light fixtures, power supplies, motors, etc.) so that they may be serviced, reset, replaced or recalibrated by service people with normal service tools and equipment. Do not install equipment in passageways, doorways, scuttles or crawlspaces which would impede or block the intended usage.
- C. Install equipment and products complete as directed by manufacturer's installation instructions. Obtain installation instructions from manufacturer prior to rough-in of equipment and examine instructions thoroughly. When requirements of installation instructions conflict with Contract Documents, request clarification from Architect prior to proceeding with installation. This includes proper installation methods, sequencing, and coordination with other trades and disciplines.
- D. Temporary Power:
  1. Design of temporary power for construction is the responsibility of the Contractor. Remove temporary power prior to completion of Project.
  2. Coordinate requirements for temporary power with local utility.
- E. Earthwork:
  1. Confirm Earthwork requirements in Contract Documents. In the absence of specific requirements, comply with individual Division 26, Electrical Sections and the following:
    - a. Perform excavation, dewatering, shoring, bedding, and backfill required for installation of work in this Division in accordance with related earthwork Sections. Contact utilities and locate existing utilities prior to excavation. Repair any work damaged during excavation or backfilling.
    - b. Excavation: Do not excavate under footings, foundation bases, or retaining walls.





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- c. Provide protection of underground systems. Review the project Geotechnical Report for references to corrosive or deleterious soils which will reduce the performance or service life of underground systems materials.
- F. Firestopping:
  - 1. Confirm requirements in Division 07, Thermal and Moisture Protection. In the absence of specific requirements, comply with individual Division 26, Electrical Sections and the following:
    - a. Coordinate location and protection level of fire and/or smoke rated walls, ceilings, and floors. When these assemblies are penetrated, seal around piping and equipment with approved firestopping material. Install firestopping material complete as directed by manufacturer's installation instructions. Meet requirements of ASTM E814, Standard Test Method for Fire Tests of Through-Penetration Fire Stops.
- G. Plenums:
  - 1. In plenums, provide plenum rated materials that meet the requirements to be installed in plenums. Immediately notify Architect/Engineer of discrepancy.
- H. Start up equipment, in accordance with manufacturer's start-up instructions, and in presence of manufacturer's representative. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.
- I. Provide miscellaneous supports/metals required for installation of equipment and conduit.

**3.2 SEISMIC CONTROL**

- A. Confirm Seismic Control requirements in Division 01, General Requirements, Structural documents, and individual Division 26 Electrical Sections.
- B. General:
  - 1. Earthquake resistant designs for Electrical (Division 26) equipment and distribution, i.e. power distribution equipment, generators, UPS, etc. to conform to regulations of jurisdiction having authority.
  - 2. Restraints which are used to prevent disruption of function of piece of equipment because of application of horizontal force to be such that forces are carried to frame of structure in such a way that frame will not be deflected when apparatus is attached to a mounting base and equipment pad, or to structure in normal way, utilizing attachments provided. Secure equipment and distribution systems to withstand a force in direction equal to value defined by jurisdiction having authority.
  - 3. Provide stamped shop drawings from licensed Structural Engineer of seismic bracing and seismic movement assemblies for conduit and equipment. Submit shop drawings along with equipment submittals.

4. Provide stamped shop drawings from licensed Structural Engineer of seismic flexible joints for conduit crossing building expansion or seismic joints. Submit shop drawings along with seismic bracing details.
5. Provide means to prohibit excessive motion of electrical equipment during earthquake.

### **3.3 REVIEW AND OBSERVATION**

- A. Confirm Review and Observation requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 26 00 00, Electrical Basic Requirements and individual Division 26, Electrical Sections.
- B. Notify Architect, in writing, at following stages of construction so that they may, at their option, visit site for review and construction observation:
  1. Underground conduit installation prior to backfilling.
  2. Prior to covering walls.
  3. Prior to ceiling cover/installation.
  4. When main systems, or portions of, are being tested and ready for inspection by AHJ.
- C. Final Punch:
  1. Prior to requesting a final punch visit from the Engineer, request from Engineer the Electrical Precloseout Checklist, complete the checklist confirming completion of systems' installation, and return to Engineer. Request a final punch visit from the Engineer, upon Engineer's acceptance that the electrical systems are ready for final punch.
  2. Costs incurred by additional trips required due to incomplete systems will be the responsibility of the Contractor.

### **3.4 CONTINUITY OF SERVICE**

- A. Confirm requirements in Division 00, Procurement and Contracting Requirements, and Division 01, General Requirements. In the absence of specific requirements in Division 01, General Requirements, comply with individual Division 26, Electrical Sections and the following:
  1. During remodeling or addition to existing structure, while existing structure is occupied, present services to remain intact until new construction, facilities or equipment is installed.
  2. Prior to changing over to new service, verify that every item is thoroughly prepared. Install new wiring, and wiring to point of connection.

3. Coordinate transfer time to new service with Owner. If required, perform transfer during off-peak hours. Once changeover is started, pursue to its completion to keep interference to a minimum.
  - a. If overtime is necessary, there will be no allowance made by Owner for extra expense for such overtime or shift work.
4. No interruption of services to any part of existing facilities will be permitted without express permission in each instance from Owner. Requests for outages must state specific dates, hours and maximum durations, with outages kept to these specific dates, hours and maximum durations. Obtain written permission from Owner for any interruption of power, lighting or signal circuits and systems.
  - a. Organize work to minimize duration of power interruption.
  - b. Coordinate utility service outages with utility company.

### **3.5 CUTTING AND PATCHING**

- A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In the absence of specific requirements in Division 01, General Requirements, comply with individual Division 26, Electrical Sections and the following:
  1. Proposed floor cutting/core drilling/sleeve locations to be approved by Project Structural Engineer. Submit proposed locations to Architect/Project Structural Engineer. Where slabs are of post tension construction, perform x-ray scan of proposed penetration locations and submit scan results including proposed penetration locations to Project Structural Engineer/Architect for approval. Where slabs are of waffle type construction, show column cap extent and cell locations relative to proposed penetration(s).
  2. Cutting, patching and repairing for work specified in this Division including plastering, masonry work, concrete work, carpentry work, and painting included under this Section will be performed by skilled craftspeople of each respective trade in conformance with appropriate Division of Work.
  3. Additional openings required in building construction to be made by drilling or cutting. Use of jack hammer is specifically prohibited. Patch openings in and through concrete and masonry with grout.
  4. Restore new or existing work that is cut and/or damaged to original condition. Patch and repair specifically where existing items have been removed. This includes repairing and painting walls, ceilings, etc. where existing conduit and devices are removed as part of this project. Where alterations disturb lawns, paving, and/or walks, surfaces to be repaired, refinished and left in condition matching existing prior to commencement of work.
  5. Additional work required by lack of proper coordination will be provided at no additional cost to the Owner.



## **SECTION 26 00 00 ELECTRICAL BASIC REQUIREMENTS**

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### **3.6 EQUIPMENT SELECTION AND SERVICEABILITY**

- A. Replace or reposition equipment which is too large or located incorrectly to permit servicing, at no additional cost to Owner.

### **3.7 DELIVERY, STORAGE AND HANDLING**

- A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In the absence of specific requirements, comply with individual Division 26, Electrical Sections and the following:
  - 1. Handle materials delivered to project site with care to avoid damage. Store materials on site inside building or protected from weather, dirt and construction dust. Products and/or materials that become damaged due to water, dirt, and/or dust as a result of improper storage and handling to be replaced before installation.
  - 2. Protect equipment to avoid damage. Close conduit openings with caps or plugs. Keep motors and bearings in watertight and dustproof covers during entire course of installation.
  - 3. Protect bus duct and similar items until in service.

### **3.8 DEMONSTRATION**

- A. Confirm Demonstration requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, and individual Division 26, Electrical Sections.
- B. Upon completion of work and adjustment of equipment, test systems and demonstrate to Owner's Authorized Representative, Architect, and Engineer that equipment furnished and installed or connected under provisions of these Specifications functions in manner required. Provide field instruction to Owner's Maintenance Staff as specified in Division 01, General Requirements, Section 26 00 00, Electrical Basic Requirements and individual Division 26, Electrical Sections.
- C. Manufacturer's Field Services: Furnish services of a qualified person at time approved by Owner, to instruct maintenance personnel, correct defects or deficiencies, and demonstrate to satisfaction of Owner that entire system is operating in satisfactory manner and complies with requirements of other trades that may be required to complete work. Complete instruction and demonstration prior to final job site observations.

### **3.9 CLEANING**

- A. Confirm Cleaning requirements in Division 01, General Requirements, Section 26 00 00, Electrical Basic Requirements and individual Division 26, Electrical Sections.
- B. Upon completion of installation, thoroughly clean electrical equipment, removing dirt, debris, dust, temporary labels and traces of foreign substances. Throughout work, remove construction debris and surplus materials accumulated during work.



## **SECTION 26 00 00 ELECTRICAL BASIC REQUIREMENTS**

## **DIVISION 26**

### **3.10 INSTALLATION**

- A. Confirm Installation requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 26 00 00, Electrical Basic Requirements and individual Division 26, Electrical Sections.
- B. Install equipment and fixtures in accordance with manufacturers' installation instructions, plumb and level and firmly anchored to vibration isolators. Maintain manufacturer's recommended clearances.
- C. Start up equipment, in accordance with manufacturer's start-up instructions, and in presence of manufacturer's representative. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.
- D. Provide miscellaneous supports/metals required for installation of equipment.

### **3.11 PAINTING**

- A. Confirm requirements in Division 01, General Requirements and Division 09, Finishes. In the absence of specific requirements, comply with individual Division 26, Electrical Sections and the following:
  - 1. Ferrous Metal: After completion of work, thoroughly clean and paint exposed supports constructed of ferrous metal surfaces (i.e., hangers, hanger rods, equipment stands, etc.) with one coat of black asphalt varnish for exterior or black enamel for interior, suitable for hot surfaces.
  - 2. In Electrical Room, on roof or other exposed areas, equipment not painted with enamel to receive two coats of primer and one coat of rustproof enamel, colors as selected by Architect.
  - 3. See individual equipment Specifications for other painting.
  - 4. Structural Steel: Repair damage to structural steel finishes or finishes of other materials damaged by cutting, welding or patching to match original.
  - 5. Conduit: Clean, primer coat and paint interior/exterior conduit exposed in public areas with two coats paint suitable for metallic surfaces. Color selected by Architect.
  - 6. Covers: Covers such as manholes, vaults and the like will be furnished with finishes which resist corrosion and rust.

### **3.12 DEMOLITION**

- A. Confirm requirements in Division 01, General Requirements and Division 02, Existing Conditions. In the absence of specific requirements, comply with individual Division 26, Electrical Sections and the following:
  - 1. It is the intent of these documents to provide necessary information and adjustments to electrical system required to meet code, and accommodate installation of new work.



**SECTION 26 00 00  
ELECTRICAL BASIC  
REQUIREMENTS**

**DIVISION 26**

2. Coordinate with Owner so that work can be scheduled not to interrupt operations, normal activities, building access or access to different areas. Owner will cooperate to best of their ability to assist in coordinated schedule, but will remain final authority as to time of work permitted.
3. Examination:
  - a. Determine exact location of existing utilities and equipment before commencing work, compensate Owner for damages caused by failure to locate and preserve utilities. Replace damaged items with new material to match existing.
  - b. Verify that abandoned wiring and equipment serve only abandoned facilities.
  - c. Demolition drawings are based on casual field observation and existing record documents.
    - 1) Verify accuracy of information shown prior to bidding and provide such labor and material as is necessary to accomplish work.
    - 2) Verify location and number of electrical outlets, luminaires, panels, etc. in field.
  - d. Report discrepancies to Architect before disturbing existing installation.
    - 1) Promptly notify Owner if utilities are found which are not shown on Drawings.
4. Execution:
  - a. Remove existing luminaires, switches, receptacles, and other electrical equipment and devices and associated wiring from walls, ceilings, floors, and other surfaces scheduled for remodeling, relocation, or demolition unless shown as retained or relocated on Drawings.
  - b. Provide temporary wiring and connections to maintain electrical continuity of existing systems during construction. Remove or relocate electrical boxes, conduit, wiring, equipment, and luminaires, as encountered in removed or remodeled areas in existing construction affected by this work.
  - c. Remove and restore wiring which serves usable existing outlets clear of construction or demolition.
  - d. If existing junction boxes will be made inaccessible, or if abandoned outlets serve as feed through boxes for other existing electrical equipment which is being retained, provide new conduit and wire to bypass inaccessible junction boxes and abandoned outlets.



## SECTION 26 00 00 ELECTRICAL BASIC REQUIREMENTS

## DIVISION 26

- e. If existing conduits pass through partitions or ceiling which are being removed or remodeled, provide new conduit and wire to reroute clear of construction or demolition and maintain service to existing load.
- f. Extend circuiting and devices in existing walls to be furred out.
- g. Remove abandoned wiring to source of supply.
- h. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
- i. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets which are not removed.
- j. Disconnect and remove abandoned panelboards and distribution equipment.
- k. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.
- l. Existing lighting which is to remain, leave luminaires in proper working order.
- m. Repair adjacent construction and finishes damaged during demolition work.
- n. Maintain access to existing electrical installations which remain active. Modify installation or provide access panel as appropriate.

### 3.13 ACCEPTANCE

- A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In the absence of specific requirements, comply with individual Division 26, Electrical Sections and the following:
  - 1. System cannot be considered for acceptance until work is completed and demonstrated to Architect that installation is in strict compliance with Specifications, Drawings and manufacturer's installation instructions, particularly in reference to following:
    - a. Cleaning
    - b. Operation and Maintenance Manuals
    - c. Training of Operating Personnel
    - d. Record Drawings
    - e. Warranty and Guaranty Certificates



## **SECTION 26 00 00 ELECTRICAL BASIC REQUIREMENTS**

### **DIVISION 26**

- f. Start-up/Test Document and Commissioning Reports

#### **3.14 FIELD QUALITY CONTROL**

- A. Confirm Field Quality Control requirements in Division 01, General Requirements, Section 26 00 00, Electrical Basic Requirements and individual Division 26, Electrical Sections.
- B. Tests:
  - 1. Conduct tests of equipment and systems to demonstrate compliance with requirements specified. Reference individual Specification Sections for required tests. Document tests and include in operation and maintenance manuals.
  - 2. During site evaluations by Architect or Engineer, provide appropriate personnel with tools to remove and replace trims, covers, and devices so that proper evaluation of installation can be performed.

#### **3.15 LETTER OF CONFORMANCE**

- A. Provide Letter of Conformance, copies of manufacturers' warranties and extended warranties with a statement that Electrical items were installed in accordance with manufacturers' recommendations, UL listings and FM Global approvals. Include Letter of Conformance, copies of manufacturers' warranties and extended warranties in Operation and Maintenance Manuals.

#### **3.16 SALVAGED EQUIPMENT AND RECYCLED MATERIAL**

- A. Salvage the following equipment not being reused and return to Owner:
  - 1. Luminaires
  - 2. Panelboards
  - 3. Breakers
- B. Electrical equipment that cannot be salvaged for reuse, sell/give to recycling company. Recycle following excess, removed, or demolished electrical material:
  - 1. Copper or aluminum conductors, buses, and motor/transformer windings.
  - 2. Steel and aluminum from raceways, boxes, enclosures, and housings.
  - 3. Acrylic and glass from luminaire lenses/refractors.
- C. Provide separate on-site storage space for recycled and salvaged material. Clearly label space.
- D. Confirm additional salvaged equipment and recycled materials in the Contract Documents.

**END OF SECTION**



**SECTION 26 00 05  
ELECTRICAL PRE-CLOSEOUT CHECKLIST**

**PART 1 - GENERAL**

**1.1 WORK INCLUDED**

- A. Grounding and Bonding
- B. Lighting
- C. Mechanical/Plumbing Equipment Installation
- D. Panelboards
- E. Raceways
- F. Switchboards

**1.2 PRE-CLOSEOUT CHECKLIST SUBMITTAL**

- A. Two weeks prior to the Engineer's Punch-Walk request, complete and submit Pre-Closeout Checklist to document compliance with the Contract Documents and that systems are functionally operational and ready for Closeout Inspection.
- B. A Closeout/Punch-Walk inspection will only be scheduled after completion of Pre-Closeout Checklist and Engineer's acceptance of its completeness.
- C. The Pre-Closeout Checklist is a general guide to document compliance with the Contract Documents and is not an all-inclusive list of Contract requirements, and it is the responsibility of the Contractor to ensure the installation is complete and in full conformance with the Contract Documents.
- D. Complete and submit Pre-Closeout Checklist, as indicated in Part 3.
- E. Unless all similar equipment have exactly the same level of completeness, reproduce the Checklist as needed and submit one checklist for each piece of equipment.

**PART 2 - EQUIPMENT - NOT USED**

**PART 3 - INSTALLATION**

**3.1 PRE-CLOSEOUT CHECKLIST**

- A. Grounding and Bonding:
  - 1. Installation:

Yes	No	Task	Comment
		Ground rods driven so that a minimum of 8-feet is in contact with soil. Any portion of ground rod	



**SECTION 26 00 05  
ELECTRICAL PRE-CLOSEOUT  
CHECKLIST**

**DIVISION 26**

Yes	No	Task	Comment
		remaining above ground, and connections to ground rod are protected from physical damage.	
		Test wells provided at ground rods where indicated in contract documents.	
		Water service and other metal piping bonded to grounding system.	
		Metal raceway systems bonded.	
		Equipment grounding conductors installed.	
		Receptacles tested for proper grounding and polarity.	
		Bonding and grounding properly torqued at all connection and termination points.	
		Separately derived systems grounded per contract documents and code.	

2. Testing:

Yes	No	Task	Comment
		Grounding system resistance to ground tested. Results not to exceed limits stated in specifications. Test results submitted.	
		Tests listed in NETA Standard AB and done in accordance with NETA standard ATS.	

B. Lighting:

1. Installation:

Yes	No	Task	Comment
		Installed per manufacturer's instructions.	
		Luminaires uniformly aligned and level.	
		No interference with required clearances for other equipment.	



**SECTION 26 00 05  
ELECTRICAL PRE-CLOSEOUT  
CHECKLIST**

**DIVISION 26**

Yes	No	Task	Comment
		Emergency power provided to emergency egress luminaires.	
		UL 924 relays provided as required for intended luminaire control.	
		Unswitched hots provided to all exit signs.	
		Exit sign directional arrows in place.	
		All luminaires cleaned inside and out, and relamped per specifications.	
		Mounting support provided per IBC.	
		Concrete bases provided for pole mounted exterior luminaires.	
		All lamps are operational.	
		LED drivers access provided per manufacturer instructions. Provide close coordinations for areas with very high ceilings.	
		Surface mounted luminaires and exit signs properly secured to prevent movement.	
		All specified luminaire accessories installed.	
		Grounding and bonding complete.	
		Adequate accessibility provided at remote ballasts and drivers. Conductors to remote ballasts and drivers are upsized as required for voltage drop.	
		Adjustable luminaires are adjusted and aimed as indicated in contract documents.	
		Any damage to luminaires has been repaired or luminaires replaced.	

2. Testing:

Yes	No	Task	Comment
		All luminaries are operational and properly connected. Demonstrate luminaires operation for minimum of 2 hours.	



**SECTION 26 00 05  
ELECTRICAL PRE-CLOSEOUT  
CHECKLIST**

**DIVISION 26**

**C. Mechanical/Plumbing Equipment Installation:**

**1. Installation:**

Yes	No	Task	Comment
		Power provided to equipment disconnects.	
		Power provided to equipment control panels.	
		Correct voltage provided to equipment.	
		Correct motor rotation verified.	
		Equipment disconnects and starters located within sight of equipment served.	
		Code clearance provided in and around disconnect switches and starters.	
		Terminations properly torqued.	
		Proper size fuses installed in disconnect switches.	
		Exterior disconnect switches and starters are type NEMA 3R or 4X.	
		Weatherproof maintenance receptacle provided within 25-feet of equipment.	

**2. Controls:**

Yes	No	Task	Comment
		Required controls installed.	

**D. Panelboards:**

**1. Installation:**

Yes	No	Task	Comment
		Securely mounted and seismically braced as required.	
		Permanent ID label installed.	
		Arc-flash labels installed.	
		Electronic breakers settings set as per the Electrical Distribution Studies.	
		Nameplates installed.	
		Grounding and bonding complete.	



**SECTION 26 00 05  
ELECTRICAL PRE-CLOSEOUT  
CHECKLIST**

**DIVISION 26**

Yes	No	Task	Comment
		Interior and exterior clean of construction dust and debris.	
		Any damage to enclosure has been repaired or replaced.	
		Door(s) work and close properly.	
		Key works and door(s) lock properly.	
		Filler plates installed in all unused spaces.	
		Spare conduit provided out of recessed panels.	
		Typed panel directories are up to date and complete.	
		Permanent identification numbers installed at each pole position.	
		Handle guards provided where indicated on plans and as required by code.	
		Tie handles installed for multi-wire branch circuits (unless separate neutrals provided for each circuit).	
		AIC rating exceeds AFC noted on plans.	
		Panel wiring diagram, UL label, and short circuit rating provided on interior of panel.	
		Phase loads checked and balanced.	
		Breaker terminations are tight.	
		Feeder lugs torqued per manufacturer's instructions.	

2. Testing:

Yes	No	Task	Comment
		Shunt trip circuit breakers tested.	
		GFCI breakers tested.	
		Grounding and bonding tested.	

E. Raceways:

1. Installation:

Yes	No	Task	Comment
		Installed per NECA 101.	



**SECTION 26 00 05  
ELECTRICAL PRE-CLOSEOUT  
CHECKLIST**

**DIVISION 26**

Yes	No	Task	Comment
		Appropriate type used in exposed locations.	
		Pull stings installed in all empty conduit and secured at each end.	
		Caps provided at ends of empty conduit.	
		Labels provided at both ends of empty conduit with location of opposite end.	
		Flexible metal conduit used at motor and equipment connections subject to movement and/or vibration.	
		Metal conduit not in contact with HVAC ductwork, piping, or other objects or equipment.	
		Conduit minimum 12 inches away from steam and hot water radiant heating lines and 3 inches away from waste and water lines.	
		Supports provided per code.	
		No unrelated conduit in elevator equipment rooms.	
		No conduit runs between floors in stairwells.	
		Conduit fitting types per specifications.	
		Conduit fittings properly tightened and providing an effective ground path.	

**F. Switchboards:**

**1. Installation:**

Yes	No	Task	Comment
		Seismically braced.	
		Switches/breakers have permanent labels.	
		Arc-flash labels installed.	
		Nameplates installed.	
		Grounding and bonding complete.	
		Interior and exterior clean of construction dust and debris.	



**SECTION 26 00 05  
ELECTRICAL PRE-CLOSEOUT  
CHECKLIST**

**DIVISION 26**

Yes	No	Task	Comment
		Housekeeping pad installed.	
		Any damage to enclosure has been repaired or replaced.	
		Electronic breakers settings set as per the Electrical Distribution Studies.	
		AIC rating exceeds AFC noted on plans.	
		Busbars and feeder lugs torqued per manufacturer instructions.	
		Adjustable breaker trip and time delay settings set per fault current, coordination, and arc-flash studies.	
		Adequate ventilation in room.	

2. Testing:

Yes	No	Task	Comment
		Tested per NETA STD ATS, Section 7.1.	
		Insulation resistance tested with Megger and results submitted.	
		Key interlock systems checked, tested, and properly functioning.	
		Shunt trip circuit breakers tested.	
		Grounding and bonding tested.	
		Circuit breakers ground fault protection tested.	
		Control wiring tested.	

**END OF SECTION**

**SECTION 26 05 09  
EQUIPMENT WIRING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Work Included:
  - 1. Equipment connections, whether furnished by Owner or other Divisions of the Contract.

**1.2 RELATED SECTIONS**

- A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

**1.4 SUBMITTALS**

- A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.
- B. In addition:
  - 1. Verify mechanical and utilization equipment electrical characteristics with Drawings and equipment submittals prior to ordering equipment. Submit confirmation of this verification as a part of, or addendum to, the electrical product submittals.

**1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements apply to this Section.

**1.6 WARRANTY**

- A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

**PART 2 - PRODUCTS**

**2.1 MATERIALS**

- A. Materials and Equipment for Equipment Wiring: As specified in individual Sections.

**2.2 GENERAL**

- A. Unless otherwise noted, the following voltage and phase characteristics apply to motors:





## **SECTION 26 05 09 EQUIPMENT WIRING**

## **DIVISION 26**

1. 3/4 HP and Under: 120 volt, 1 phase.
  2. 1 HP and Over: 208 volt, 3 phase.
- B. Safety Switches: Provide as required by CEC and as specified in Section 26 28 16, Enclosed Switches and Circuit Breakers.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Prior to submittal of product data for electrical distribution equipment, obtain and examine product data and shop drawings for equipment furnished by the Owner and by other trades on the project. Update the schedule of equipment electrical connections accordingly, noting proper ratings for overcurrent devices, fuses, safety disconnect switches, conduit and wiring, and the like. As a minimum, this requirement applies to equipment furnished by Owner and equipment furnished under the following divisions of work under this contract:
1. Division 08, Openings
  2. Division 11, Equipment
  3. Division 21, Fire Suppression
  4. Division 22, Plumbing
  5. Division 23, HVAC, Heating, Ventilating and Air Conditioning
  6. Division 27, Communications
  7. Division 28, Electronic Safety and Security

#### **3.2 INSTALLATION**

- A. Do not install unrelated electrical equipment or wiring on mechanical equipment without prior approval of Engineer.
- B. Provide moisture tight equipment wiring and switches in ducts or plenums used for environmental air.
- C. Connect motor and appliance/utilization equipment complete from panel to motor/equipment as required by code.
- D. Install motor starters and controllers for equipment furnished by others.
- E. Appliance/Utilization Equipment:
1. Provide appropriate cable and cord cap for final connection unless equipment is provided with same. Provide receptacle configured to receive cord cap.



## **SECTION 26 05 09 EQUIPMENT WIRING**

## **DIVISION 26**

2. Verify special purpose outlet NEMA configuration and ampere rating with equipment supplier prior to ordering wiring devices and coverplates.

### **3.3 FIELD QUALITY CONTROL**

- A. Perform field inspection and testing in accordance with Division 01, General Requirements.

### **3.4 SYSTEMS STARTUP**

- A. Provide field representative to prepare and start equipment.
  1. Test and correct for proper rotation of polyphase motors.
- B. Adjust for proper operation within manufacturer's published tolerances.
- C. Demonstrate proper operation of equipment to Owner's Authorized Representative.

**END OF SECTION**

**SECTION 26 05 19**  
**LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Work Included:
  - 1. Lugs and Pads
  - 2. Wires and Cables
  - 3. Splices
  - 4. Connectors

**1.2 RELATED SECTIONS**

- A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

**1.4 SUBMITTALS**

- A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.
- B. In addition, provide:
  - 1. Cable insulation test reports in project closeout documentation.

**1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

**1.6 WARRANTY**

- A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Lugs and Pads:
  - 1. Anderson



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2. IIsco
  3. Panduit
  4. Thomas & Betts
  5. 3M
  6. Or approved equivalent.
- B. Wires and Cables:
1. General:
    - a. General Cable
    - b. Okonite
    - c. Southwire
    - d. Encore Wire
    - e. Or approved equivalent.
  2. Metal Clad Cable - Type MC:
    - a. Alflec
    - b. AFC
    - c. General Cable
    - d. Southwire
    - e. Encore Wire
    - f. Or approved equivalent.
- C. Splices:
1. Branch Circuit Splices:
    - a. Ideal
    - b. 3M Scotchlok
    - c. Uraseal, Inc.
    - d. Or approved equivalent.
  2. Feeder Splices:
    - a. Not allowed.



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- D. Connectors:
1. Anderson Power Products
  2. Burndy
  3. IIsco
  4. 3M
  5. Thomas & Betts
  6. Or approved equivalent.

**2.2 LUGS AND PADS**

- A. Ampacity: Cross-sectional area of pad for multiple conductor terminations to match ampere rating of panelboard bus or equipment line terminals.
- B. Copper Pads: Drilled and tapped for multiple conductor terminals.
- C. Lugs: Compression type for use with stranded branch circuit or control conductors; mechanical type for use with solid branch and feeder circuit conductors.

**2.3 WIRES AND CABLES**

- A. Building Wires:
1. Copper: Soft-drawn with conductivity of not less than 98 percent IACS at 20 degrees C (68 degrees F). 600 volt rated throughout. Conductors 12 AWG and 10 AWG, solid. Conductors 8 AWG and larger, stranded. 12 AWG minimum conductor size. Minimum insulation rating of 90 degrees C. Insulation Type: THHN/THWN-2 or XHHW-2 on roofs.
- B. Phase color to be consistent at feeder terminations; A-B-C, top to bottom, left to right, front to back.
- C. Color Code Conductors as Follows:

PHASE	208 VOLT WYE
A	Black
B	Red
C	Blue
Neutral	White
Ground	Green

- D. MC Cable:
1. Standard: High strength galvanized steel flexible armor. Full length minimum size No. 12 copper ground wire, copper dual rated THHN/THWN-2, full length tape marker phase/circuit identification on cable armor. Short circuit throat insulators, mechanical compression termination.



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- E. AC Cable (Armored Cable): Not allowed.
- F. NMB Cable: Not allowed.

**2.4 SPLICES**

- A. Branch Circuits: Twist on, high temperature, grounding type wing nuts.
  - 1. Ideal Industries Wing-Nut Twist-On Connectors.
  - 2. 3M Scotchlok Twist-On Wire Connectors.
- B. Feeders:
  - 1. Feeder splices not allowed.

**2.5 CONNECTORS**

- A. Split bolt connectors not allowed.
- B. Conductor Branch Circuits: Wire nuts with integral spring connectors for conductors 12 AWG through 8 AWG. Push-in type connectors where conductors are not required to be twisted together are not acceptable.

**PART 3 - EXECUTION**

**3.1 GENERAL INSTALLATION REQUIREMENTS**

- A. Install per manufacturer instructions and CEC.
- B. Field Quality Control:
  - 1. Test conductor insulation on feeders of 100 amp and greater for conformity with 1000 volt megohmmeter. Use Insulated Cable Engineers Association testing procedures. Minimum insulation resistance acceptable is 1 megohm for systems 600 volts and below. Notify Architect if insulation resistance is less than 1 megohm.
  - 2. Test Report: Prepare a typed tabular report indicating the testing instrument, the feeder tested, amperage rating of the feeder, insulation type, voltage, the approximate length of the feeder, conduit type, and the measured resistance of the megohmmeter test. Submit test reports with project closeout documents.
  - 3. Inspect and test in accordance with NETA Standard ATS, except Section 4.
  - 4. Perform inspections and tests listed in NETA Standard ATS, Section 7.3.2.

**3.2 LUGS AND PADS**

- A. Thoroughly clean surfaces to remove all dirt, oil, grease, or paint.
- B. Use torque wrench to tighten per manufacturer's directions.



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**3.3 WIRES AND CABLES**

**A. General:**

1. Do not install or handle thermoplastic insulated wire and cable in temperatures below -10 degrees C (14 degrees F). Do not handle thermoset insulated wire and cable in temperatures below -40 degrees C (-40 degrees F). All wire and cable must be acclimated to temperatures above freezing for no less than 24 hours prior to installation.
2. Install conductors in raceways having adequate, code size cross-sectional area for wires indicated.
3. Install conductors with care to avoid damage to insulation.
4. Do not apply greater tension on conductors than recommended by manufacturer during installation.
5. Use of pulling compounds is permitted. Clean residue from exposed conductors and raceway entrances after conductor installation. Do not use pulling compounds for installation of conductors connected to GFCI circuit breakers or GFCI receptacles.
6. Conductor Size and Quantity:
  - a. Install no conductors smaller than 12 AWG unless otherwise shown.
  - b. Provide required conductors for a fully operable system.
  - c. Power Circuits: No. 12 AWG minimum, except as follows:
    - 1) No. 10 AWG for 20A, 120V circuits longer than 60-feet but not exceeding 89-feet.
    - 2) No. 8 AWG for 20A, 120V circuits longer than 90-feet but not exceeding 139-feet.
    - 3) Notify Engineer of 20A, 120V circuits exceeding 140-feet if not shown on Drawings.
  - d. When exact run lengths are determined for all branch circuits, and prior to installation of the conductors, ensure that the maximum voltage drop, based on 80 percent of the circuit protective device, does not exceed 3 percent. Increase wire size from No. 12 AWG, if necessary, to ensure that the 3 percent voltage drop is not exceeded.
7. Provide dedicated neutrals (one neutral conductor for each phase conductor) in all 120V circuits.

**B. Conductors in Cabinets:**

1. Conductors and cables within panels and cabinets are to be made up in a clean and workmanlike manner.



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2. Cable and tree wires in panels and cabinets for power and control. Use plastic ties in panels and cabinets.
  3. Tie and bundle feeder conductors in wireways of panelboards.
  4. Hold conductors away from sharp metal edges.
- C. Homeruns:
1. Do not change intent of branch circuit homeruns without approval. Homeruns for 20A branch circuits may be combined to a maximum of six current carrying conductors including neutral conductors in homeruns. Apply derating factors as required per NEC. Increase conductor size as needed.
  2. MC cable homeruns are not allowed.
- D. Identify wire and cable under the provisions of Section 26 05 53, Identification for Electrical Systems. Identify each conductor with its panel and circuit number as indicated.
- E. Exposed cable is not allowed.
- F. All cable must be run parallel or perpendicular to building lines and hidden from view when possible. Where installed in tray each power cable is to be identified with Lamacoid nametag engraved with identification of equipment being fed. Tag to be fastened to cable using tie-wraps. Provide nametag at each floor level.
- G. Do not install PVC jacketed cables in return air plenums, unless they are specially rated plenum cables.
- H. Use of MC Cable is limited to the following conditions. Installations that do not comply with the following conditions are to be removed and replaced with no additional expense to the Owner.
1. 20 amp branch wiring where following conditions apply:
    - a. Use MC cable for final flexible connections from junction or outlet boxes to recessed fixtures. Do not use MC cables to loop between fixtures, except where it is not practical to provide conduit connections between boxes or where existing inaccessible ceilings prevent installation of conduit runs. Each individual luminaire is to be serviced by an individual cable drop from the associated junction box in the ceiling space. Maximum length 6-feet of MC cable. Luminaire drops secured to, and supported by, the building structure with nylon tie wraps. The use of the ceiling suspension system for support of any type of cabling is not permitted.
    - b. MC cable may be routed in the void space above hard lid ceilings, and routed within wall cavities, including below glazing, provided CEC requirements are otherwise met, and a minimum one 0.75-inch conduit is routed from nearest accessible ceiling space to inaccessible location, terminating in a j-box with blank faceplate, for future circuits.





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- c. Do not use in walls in areas where MC cable cannot be fished into the walls after construction is completed. For example, walls with glazing or solid beams overhead, partial height walls, etc.

**3.4 SPLICES**

- A. Make splices complete and promptly after wire installation. Provide single wire pigtails for luminaire and device connections. Wire nuts may be used for luminaire wire connections to single wire circuit conductor pigtails.
- B. Remove insulation using industry approved means and methods to ensure all conductors are free of damage upon completion.

**3.5 CONNECTORS**

- A. Install to assure a solid and safe connection.
- B. Select hand twist connectors for wire size and install tightly on conductors.
- C. Install compression connectors using methods and tools recommended by the manufacturer.
- D. Do not install stranded conductors under screw terminals unless compression lugs are installed.
- E. Do not connect wiring without UL listed connectors that are listed for the purposes.

**END OF SECTION**

**SECTION 26 05 26  
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Work Included:
  - 1. Grounding Electrodes
  - 2. Connectors and Accessories
  - 3. Grounding Busbar
  - 4. Grounding Conductor

**1.2 RELATED SECTIONS**

- A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

**1.4 SUBMITTALS**

- A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.
- B. In addition, provide:
  - 1. Test reports of ground resistance for service and separately derived system grounds.

**1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.
- B. In addition, meet the following:
  - 1. Comply with the requirements of ANSI/NFPA 70.

**1.6 WARRANTY**

- A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.



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**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Grounding Electrodes:
  - 1. Erico
  - 2. Thomas & Betts
  - 3. Talley
  - 4. Or approved equivalent.
- B. Connectors and Accessories:
  - 1. Burndy Hyground Compression System
  - 2. Erico/Cadweld
  - 3. Amp Ampact Grounding System
  - 4. Pipe Grounding Clamp:
    - a. Burndy GAR Series
    - b. O Z Gedney
    - c. Thomas & Betts
    - d. Or approved equivalent.
- C. Grounding Busbar:
  - 1. Chatsworth
  - 2. Erico
  - 3. Schneider Electric/Square D
  - 4. Panduit
  - 5. Or approved equivalent.
- D. Grounding Conductor
  - 1. General Cable
  - 2. Okonite
  - 3. Southwire



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4. Or approved equivalent

#### **2.2 GROUNDING ELECTRODES**

- A. Ground Rods: Copper-clad steel, minimum 3/4-inch diameter, 10-feet long, tapered point, chamfered top.

#### **2.3 CONNECTORS AND ACCESSORIES**

- A. Grounding Connectors: Hydraulic compression tool applied connectors or exothermic welding process connectors or powder actuated compression tool applied connectors.
- B. Pipe Grounding Clamp: Mechanical ground connector with cable parallel or perpendicular to pipe.

#### **2.4 GROUNDING BUSBAR**

- A. Grounding Busbar: 1/4-inch thick by 4-inch high by 10-inch long copper grounding busbar with insulators that meet ANSI J-STD-607-A specifications. UL 467 listed. Hole patterns in busbar to accommodate two-hole lugs, four-hole configuration.

#### **2.5 GROUNDING CONDUCTOR**

- A. Grounding Electrode Conductor: Soft-draw bare stranded copper for wire sizes larger than #10 AWG Bare. Solid copper for wire sizes #10 AWG and smaller.
- B. Equipment Grounding Conductor: Green insulated, insulation type to match that of associated feeder or branch circuit wiring, size as indicated on Drawings.

### **PART 3 - EXECUTION**

#### **3.1 GENERAL INSTALLATION REQUIREMENTS**

- A. Verify site conditions prior to beginning work.
- B. Bond sections of service equipment enclosure to service ground bus.
- C. Separately Derived Systems: Ground each separately derived system per NEC Article 250.
- D. Corrosion inhibitors: Apply a corrosion inhibitor to contact surfaces when making grounding and bonding connections. Use corrosion inhibitor appropriate for protecting a connection between metals used.
- E. Grounding system resistance to ground not to exceed 5 ohms. Make necessary modifications or additions to grounding electrode system for compliance. Submit final tests to assure that this requirement is met.
- F. Resistance of grounding electrode system: measure using a four-terminal fall-of-potential method as defined in IEEE 81. Take ground resistance measurements before electrical distribution system is energized and in normally dry conditions, not less than 48 hours after last rainfall. Take resistance measurements of separate grounding electrode



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systems before systems are bonded together below grade. Combined resistance of separate systems may be used to meet required resistance, but specified number of electrodes must still be provided.

- G. Inspect and test in accordance with NETA Standard ATS, except Section 4.
- H. Perform inspections and tests listed in NETA Standard AB, Section 7.13.

### **3.2 GROUNDING ELECTRODES INSTALLATION**

- A. Ground Rod Electrode:
  - 1. Verify that final backfill and compaction have been completed before driving rod electrodes.
  - 2. Bond #6 grounding electrode conductor to driven ground rods as indicated on Drawings.
  - 3. Tap at center ground rod and extend grounding electrode conductor to service grounding bus. Install grounding electrode conductor to service grounding bus in rigid PVC conduit for physical protection where grounding electrode conductor passes through concrete floor or other concrete structure.
- B. Metal Underground Water Service: Bond water service pipe to service equipment ground bus or to the grounding electrode system. Connect to water pipe on utility side of isolating fittings or meters, bond across water meters.
- C. Other Metal Piping Systems: Bond gas piping system, fire sprinkler piping system and other metal piping systems to service equipment ground bus or to the grounding electrode system.
- D. Bond together metal siding not attached to grounded structure; bond to grounding electrode system.

### **3.3 CONNECTORS AND ACCESSORIES INSTALLATION**

- A. Install per manufacturer's instructions.

### **3.4 GROUNDING BUSBAR INSTALLATION**

- A. Install per manufacturer's instructions.

### **3.5 GROUNDING CONDUCTOR INSTALLATION**

- A. Raceways:
  - 1. Ground metallic raceway systems. Bond to ground terminal with code size jumper except where code size or larger equipment grounding conductor is included with circuit, use grounding bushing with lay-in lug.



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2. Connect metal raceways, which terminate within an enclosure but without mechanical connection to enclosure, by grounding bushings and ground conductor to grounding bus.
  3. Where equipment supply conductors are in flexible metallic conduit, install stranded copper equipment grounding conductor from outlet box to equipment frame.
  4. Install equipment grounding conductor, code size minimum unless noted on drawings, in metallic and nonmetallic raceway systems.
- B. Feeders and Branch Circuits:**
1. Provide continuous green insulated copper equipment grounding conductors for feeders and branch circuits.
  2. Where installed in a continuous solid metallic raceway system and larger sizes are not detailed, provide insulated equipment grounding conductors for feeders and branch circuits sized in accordance with the latest adopted edition of NEC Article 250, Table 250-122.
- C. Ladder Rack and Network Cabinets:**
1. Provide continuous green insulated copper equipment ground, minimum #6 AWG, from OFCI ladder rack and network cabinets to telecom grounding busbar. Grounding conductor routed horizontally in ladder rack and vertically in conduit. Provide bushings at cut ends to protect cable insulation.
- D. Bond boxes, cabinets, enclosures and panelboard equipment grounding conductors to enclosure with specified conductors and lugs. Install lugs only on thoroughly cleaned contact surfaces.**
- E. Motors, Equipment, and Appliances: Install code size equipment grounding conductor to (motor) equipment frame or manufacturer's designated ground terminal.**
- F. Receptacles: Connect ground terminal of receptacle and associated outlet box to equipment grounding conductor. Self grounding nature of receptacle devices does not eliminate equipment grounding conductor bolted to outlet box.**

**END OF SECTION**

**SECTION 26 05 29**  
**HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS AND EQUIPMENT**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Work Included:
  - 1. Anchors, Threaded Rod, and Fasteners
  - 2. Support Channel, Hangers, and Supports
  - 3. Rooftop Conduit Supports

**1.2 RELATED SECTIONS**

- A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

**1.4 SUBMITTALS**

- A. Submittals not required for this Section.

**1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.
- B. In addition, meet the following:
  - 1. Manufacturers regularly engaged in the manufacture of bolted metal framing support systems, whose products have been in satisfactory use in similar service for not less than 10 years.
  - 2. Engineering Responsibility: Design and preparation of Shop Drawings and calculations for code required pipe support, trapeze, equipment hangers/supports, and seismic restraint by a qualified Structural Professional Engineer.
    - a. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of hangers and supports that are similar to those indicated for this Project in material, design, and extent.



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**1.6 WARRANTY**

- A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

**1.7 PERFORMANCE REQUIREMENTS**

- A. General: Provide conduit and equipment hangers and supports in accordance with the following:
1. When supports, anchorages, and seismic restraints for equipment and supports, anchorages and seismic restraints for conduit, cable tray and equipment are not shown on the Drawings, the Contractor is responsible for their design.
  2. Connections to structural framing shall not introduce twisting, torsion, or lateral bending in the framing members. Provide supplementary steel as required.
- B. Engineered Support Systems: The following support systems to be designed, detailed, and bear the seal of a professional engineer registered in the State of California.
1. Support frames such as conduit racks or stanchions for conduit and equipment which provide support from below.
  2. Equipment and piping support frame anchorage to supporting slab or structure.
- C. Provide channel support systems, for conduits to support multiple conduits capable of supporting combined weight of support systems and system contents.
- D. Provide heavy-duty steel trapezes for piping to support multiple conduit capable of supporting combined weight of supported systems and system contents.
- E. Provide seismic restraint hangers and supports for conduit and equipment.
- F. Obtain approval from AHJ for seismic restraint hanger and support system to be installed for piping and equipment.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Anchors, Threaded Rod, and Fasteners:
1. Anchor It
  2. Epcon System
  3. Hilti-Hit System
  4. Power Fast System
  5. Or approved equivalent.





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- B. Support Channel, Hangers, and Supports:
  - 1. B-Line
  - 2. Kindorf
  - 3. Superstrut
  - 4. Unistrut
  - 5. Or approved equivalent.
- C. Rooftop Conduit Supports:
  - 1. Cooper B-Line Dura-Block Rooftop Support Base
  - 2. Or approved equivalent.

**2.2 ANCHORS, THREADED ROD, AND FASTENERS**

- A. Anchors, Threaded Rod and Fasteners - General: Corrosion-resistant materials of size and type adequate to carry the loads of equipment and conduit, including weight of wire in conduit.
- B. Concrete Inserts: Cast in concrete for support fasteners for loads up to 800-pounds.
- C. Anchor Bolts for Area Luminaire Poles: As supplied by area luminaire pole manufacturer.
- D. Anchors and Fasteners:
  - 1. Do not use powder-actuated anchors.
  - 2. Concrete Structural Elements: Use precast inserts.
  - 3. Steel Structural Elements: Use beam clamps.
  - 4. Concrete Surfaces: Use self-drilling anchors.
  - 5. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use toggle bolts.
  - 6. Solid Masonry Walls: Use expansion anchors.
  - 7. Sheet Metal: Use sheet metal screws.
  - 8. Wood Elements: Use wood screws.
- E. Fasteners: Provide fasteners of types as required for assembly and installation of fabricated items; surface-applied fasteners are specified elsewhere.
- F. Bolts: Low carbon steel externally and internally threaded fasteners conforming with requirements of ASTM A307; include necessary nuts and plain hardened washers. For



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structural steel elements supporting mechanical material or equipment from building structural members or connection thereto, use fasteners conforming to ASTM A325.

- G. Miscellaneous Materials: Provide incidental accessory materials, tools, methods, and equipment required for fabrication.

**2.3 SUPPORT CHANNEL, HANGERS, AND SUPPORTS**

- A. Hangers and Supports - General: Corrosion-resistant materials of size and type adequate to carry the loads of equipment and conduit, including weight of wire in conduit.
1. Channel Material: Carbon steel.
  2. Coating: Hot dip galvanized.
- B. Pipe Straps: Two-hole galvanized or malleable iron.
- C. Luminaire Chain: Carbon steel with zinc plated finish. Rated to minimum 90-pound safe working load.
- D. Miscellaneous Metal: Provide miscellaneous metal items specified hereunder, including materials, fabrication, fastenings and accessories required for finished installation, where indicated on Drawings or otherwise not shown on drawings that are necessary for completion of the project. The Contractor is responsible for their design.
1. Fabricate miscellaneous units to size shapes and profiles indicated or, if not indicated, of required dimensions to receive adjacent other work to be retained by framing. Except as otherwise shown, fabricate from structural steel shapes and plates and steel bars, of welded construction using mitered joints for field connection. Cut, drill and tap units to receive hardware and similar items.
- E. Structural Shapes: Where miscellaneous metal items are needed to be fabricated from structural steel shapes and plates, provide members constructed of steel conforming with requirements of ASTM A36 or approved equivalent.
- F. Steel Pipe: Provide seamless steel pipe conforming to requirements of ASTM A53, Type S, Grade A, or Grade B. Weight and size required as specified.
- G. Miscellaneous Materials: Provide incidental accessory materials, tools, methods, and equipment required for fabrication.

**2.4 ROOFTOP CONDUIT SUPPORTS**

- A. Curb base made of 100 percent recycled rubber and polyurethane prepolymer with a uniform load
- B. Capacity of 500 pounds per linear foot of support.
- C. UV resistant.
- D. Steel Frame: Steel, 14 gauge strut galvanized per ASTM A653 or 12 gauge strut galvanized per ASTM A653 for bridge series.



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- E. Continuous block channel supports with 1-inch gaps to allow water flow, bridge channel supports, extendable height channel supports and elevated single conduit supports.
- F. Attaching Hardware: Zinc-plated threaded rod, nuts and attaching hardware per ASTM B633 fastened directly into rubber material with weather resistant Type 12 lag screws.
- G. Provide load distribution plates when required for heavy loads.
- H. Finish: Black with safety yellow striping.
- I. Provide hot dipped galvanized components for items exposed to weather.

**PART 3 - EXECUTION**

**3.1 GENERAL INSTALLATION REQUIREMENTS**

- A. Fabrication - Miscellaneous Metals
  - 1. General: Verify dimensions prior to fabrication. Form metal items to accurate sizes and configurations as indicated on Drawings and otherwise required for proper installation; make with lines straight and angles sharp, clean and true; drill, countersink, tap, and otherwise prepare items for connections with work of other trades, as required. Fabricate to detail of structural shapes, plates and bars; weld joints where practicable; provide bolts and other connection devices required. Include anchorages; clip angles, sleeves, anchor plates, and similar devices. Hot dipped galvanize after fabrication items installed in exterior locations. Set accurately in position as required and anchor securely to building construction. Construct items with joints formed for strength and rigidity, accurately machining for proper fit; where exposed to weather, form to exclude water.
  - 2. Finishes:
    - a. Ferrous Metal: After fabrication, but before erection, clean surfaces by mechanical or chemical methods to remove rust, scale, oil, corrosion, or other substances detrimental to bonding of subsequently applied protective coatings. For metal items exposed to weather or moisture, galvanize in manner to obtain G90 zinc coating in accordance with ASTM A123. Provide other non-galvanized ferrous metal with one coat of approved rust-resisting paint primer, in manner to obtain not less than 1.0 mil dry film thickness. Touch-up damaged areas in primer with same material, before installation. Apply zinc coatings and paint primers uniformly and smoothly; leave ready for finish painting as specified elsewhere.
    - b. Metal in contact with Concrete, Masonry and Other Dissimilar Materials: Where metal items are to be erected in contact with dissimilar materials, provide contact surfaces with coating of an approved zinc-chromate primer in manner to obtain not less than 1.0 mil dry film thickness, in addition to other coatings specified in these specifications.



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- c. For Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and apply galvanizing repair paint to comply with ASTM A780.

**3.2 ANCHORS, THREADED ROD, AND FASTENERS INSTALLATION**

- A. Safety factor of 4 required for every fastening device or support for equipment installed. Supports to withstand four times the weight of equipment it supports.
- B. Do not use other trade's fastening devices as supporting means for luminaires, equipment or materials.
- C. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.
- D. Do not use supports or fastening devices to support other than one particular item.
- E. Securely suspend junction boxes, pull boxes or other conduit terminating housings located above suspended ceiling from floor above or roof structure to prevent sagging and swaying.
- F. Provide seismic bracing per CBC requirements.
- G. Install surface-mounted cabinets and panelboards with minimum of four anchors.
- H. Use spring lock washers under fastener nuts for strut.
- I. Cutting and Drilling
  - 1. Do not drill or cut structural members without prior permission from Architect.

**3.3 SUPPORT CHANNEL, HANGERS, AND SUPPORTS INSTALLATION**

- A. Install hangers and supports as required to adequately and securely support electrical system components, in a neat and workmanlike manner, as specified in NECA 1.
- B. Safety factor of 4 required for every fastening device or support for equipment installed. Supports to withstand four times the weight of equipment it supports.
- C. Verify mounting height of luminaires prior to installation when heights are not detailed.
- D. Install vertical support members for equipment and luminaires, straight and parallel to building walls.
- E. Install horizontal support members straight and parallel to ceilings or finished floor unless otherwise noted.
- F. Provide independent supports to structural member for luminaires, materials, or equipment installed in or on ceiling, walls or in void spaces or over suspended ceilings.
- G. Do not use other trade's fastening devices as supporting means for luminaires, equipment or materials.



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- H. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.
- I. Do not use supports or fastening devices to support other than one particular item.
- J. Support conduits within 18-inches of outlets, boxes, panels, cabinets and deflections unless more stringently required by CEC.
- K. Maximum distance between supports not to exceed 8 foot spacing unless otherwise required by CEC.
- L. Support flexible conduits and metal clad cable within 12-inches of outlets, boxes, panels, cabinets and deflections unless otherwise required by CEC.
- M. Maximum distance between supports for flexible conduits and metal clad cable not to exceed 48-inches spacing unless otherwise required by CEC.
- N. Maximum distance between supports for rigid PVC conduits unless otherwise required by CEC is as follows:
  - 1. 1-inch conduit, 3-feet apart.
  - 2. 1-1/4-inch or 1-1/2-inch and 2-inch conduit, 4-feet apart.
  - 3. 2-1/2-inch and 3-inch conduit, 5-feet apart.
  - 4. 4-inch conduit, 6-feet apart.
- O. Install strut hangers as instructed by strut manufacturer. Suspend strut hangers as instructed by strut manufacturer for the load, with a maximum spacing of 8-feet on center and within 2-feet of outlet box, cabinet, junction box or other channel raceway termination unless otherwise required by CEC.
- P. Coordinate routing of conduit racks with materials and equipment installed by other trades. Where conduit racks are exposed to view, coordinate location and installation with Architect for optimal appearance.
- Q. Securely suspend junction boxes, pull boxes or other conduit terminating housings located above suspended ceiling from floor above or roof structure to prevent sagging and swaying.
- R. Provide seismic bracing per CBC requirements.
- S. Install surface-mounted cabinets and panelboards with minimum of four anchors.
- T. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.
- U. Wet and Damp Locations:
  - 1. In wet and damp locations use steel channel supports to stand cabinets and panelboards 1-inch off wall.



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**3.4 ROOFTOP CONDUIT SUPPORTS INSTALLATION**

- A. Consult roofing manufacturer for roof membrane compression capacities. If necessary, provide a compatible sheet of roofing material (rubber pad) under rooftop support to disperse concentrated loads and add further membrane protection.
- B. Do not use supports that will void roof warranty.
- C. Install supports per manufacturer's instructions and recommendations.
- D. Use properly sized clamps to suit conduit sizes.
- E. Install supports for rooftop raceways to raise raceways a minimum of 7/8-inches above the roof structure unless otherwise noted.

**END OF SECTION**

**SECTION 26 05 33  
RACEWAYS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Work Included:
  - 1. Rigid Metal Conduit (RMC)
  - 2. Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Metal Conduit
  - 3. Electrical Metallic Tubing (EMT)
  - 4. Flexible Metal Conduit (FMC)
  - 5. Liquidtight Flexible Metal Conduit (LFMC)
  - 6. Electrical Polyvinyl Chloride (PVC) Conduit
  - 7. Conduit Fittings
- B. Provide a complete system of conduit and fittings, with associated couplings, connectors, and fittings, as shown on Drawings and described in these Specifications.

**1.2 RELATED SECTIONS**

- A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.
- B. In addition, reference the following:
  - 1. Section 26 05 29, Hangers and Supports for Electrical Systems and Equipment
  - 2. Section 26 05 34, Boxes

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.
- B. In addition, meet the following:
  - 1. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing.

**1.4 SUBMITTALS**

- A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.



**1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

**1.6 WARRANTY**

- A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

**1.7 DEFINITIONS**

- A. Raceway system is defined as consisting of conduit, tubing, duct, and fittings including but not limited to connectors, couplings, offsets, elbows, bushings, expansion/deflection fittings, and other components and accessories. Complete electrical raceway installation before starting the installation of conductors and cables.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Rigid Metal Conduit (RMC):
  - 1. Allied Tube & Conduit
  - 2. Beck Manufacturing Inc.
  - 3. Picoma
  - 4. Wheatland Tube Company
  - 5. Or approved equivalent.
- B. Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit:
  - 1. Allied Tube & Conduit
  - 2. Thomas & Betts Corporation
  - 3. Robroy Industries
  - 4. O'kote Inc.
  - 5. Or approved equivalent.
- C. Electrical Metallic Tubing (EMT):
  - 1. Allied Tube & Conduit
  - 2. Beck Manufacturing WL
  - 3. Picoma





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4. Wheatland Tube Company
  5. Or approved equivalent.
- D. Flexible Metal Conduit (FMC):
1. AFC Cable Systems Inc.
  2. Electri-Flex Company
  3. International Metal Hose
  4. Or approved equivalent.
- E. Liquidtight Flexible Metal Conduit (LFMC):
1. AFC Cable Systems Inc.
  2. Electri-Flex Company
  3. International Metal Hose
  4. Or approved equivalent.
- F. Electrical Polyvinyl Chloride (PVC) Conduit:
1. AFC Cable Systems Inc.
  2. Electri-Flex Company
  3. International Metal Hose
  4. JM Eagle
  5. Or approved equivalent.
- G. Conduit Fittings:
1. Bushings:
    - a. Insulated Type for Threaded Raceway Without Factory Installed Plastic Throat Conductor Protection:
      - 1) Thomas & Betts 1222 Series
      - 2) O-Z Gedney B Series
      - 3) Or approved Equivalent.
  2. Raceway Connectors and Couplings:
    - a. Thomas & Betts Series

- b. O-Z Gedney Series
- c. Or approved Equivalent.

## **2.2 RIGID METAL CONDUIT (RMC)**

- A. UL 6, ANSI C80.1. Hot dipped galvanized steel conduit after thread cutting.
  - 1. Fittings: NEMA FB2.10.

## **2.3 POLYVINYL CHLORIDE (PVC) EXTERNALLY COATED GALVANIZED RIGID METAL CONDUIT**

- A. Description: UL 6, ANSI C80.1, and NEMA RN 1; rigid steel conduit with external PVC coating.
  - 1. PVC Coating: Minimum 40 mils in thickness.
- B. Fittings and Conduit Bodies: NEMA FB 1; steel fittings with external PVC coating to match conduit.

## **2.4 ELECTRICAL METALLIC TUBING (EMT)**

- A. Description: UL 797, ANSI C80.3; steel galvanized tubing.
- B. Fittings: NEMA FB 1; steel, compression type.

## **2.5 FLEXIBLE METAL CONDUIT (FMC)**

- A. Description: UL 1, interlocked steel construction.
- B. Fittings: NEMA FB 2.20.

## **2.6 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)**

- A. Description: UL 360, inner core made from spiral wound strip of heavy gauge, hot dipped galvanized low carbon steel. 3/4-inch through 1-1/4-inch trade sizes to have a square lock core and contain an integral bonding strip of copper. 1-1/2-inch and larger to have fully interlocked core. Jacket material to be moisture, oil, and sunlight resistant flexible PVC.
- B. Fittings: NEMA FB 2.20.

## **2.7 ELECTRICAL POLYVINYL CHLORIDE (PVC) CONDUIT**

- A. Description: UL 651, NEMA TC 2; Schedule 40 PVC.
- B. Fittings: NEMA TC 3.
- C. Plastic Utilities Duct: NEMA TC 6/8; PVC Type DB.
- D. Plastic Utility Duct Fittings: NEMA TC 9.

**2.8 CONDUIT FITTINGS**

A. Bushings:

1. Insulated type for threaded raceway connectors without factory-installed plastic throat conductor protection.
2. Insulated grounding type for threaded raceway connectors.

B. Raceway Connectors and Couplings:

1. Steel connectors, couplings, and conduit bodies, hot-dip galvanized.
2. Connector locknuts to be steel, with threads meeting ASTM tolerances. Locknuts to be hot-dip galvanized.
3. Connector throats (EMT, flexible conduit, metal clad cable and cordset connectors) to have factory installed plastic inserts permanently installed. For normal cable or conductor exiting angles from raceway, the cable jacket or conductor insulation to bear only on plastic throat insert.
4. Steel gland, Tomic or Breagle connectors and couplings are recognized for this Contract as having acceptable raceway to fitting electrical conductance.
5. Set screw connectors and couplings, without integral compression glands, are recognized for this Contract as not having acceptable raceway to fitting electrical conductance. A ground conductor sized per this Specification must be included and bonded within raceway assembly utilizing this type connector or coupling.

**PART 3 - EXECUTION**

**3.1 GENERAL INSTALLATION REQUIREMENTS**

- A. Finished Surfaces: Schedule raceway installation to avoid conflict with installed wall and ceiling surfaces. If unavoidable, coordinate work and repairs with Architect.
- B. Conduit Size:
1. Minimum Size: 3/4-inch for power and control, unless otherwise noted.
- C. Underground Installations:
1. More than 5-feet from Foundation Wall: Use PVC.
  2. Within 5-feet from Foundation Wall: Use PVC coated RMC.
  3. In or Under Slab on Grade: Use PVC.
  4. Minimum Size: 1-inch.
- D. Provide two pull strings/tapes in empty conduits. Types:

1. High-strength, stretch resistant, woven polyester. Factory lubricated to reduce burn-through.
  2. Feeders: 5/8-inch, 1,800-pound rated, Greenlee 4436, Mule Tape, Herculine, or approved equivalent.
  3. Branch Circuits and Low Voltage: 1/2-inch, 1,250-pound rated, Greenlee 4435, Mule Tape, Herculine, or approved equivalent.
  4. If fish tape is used for pulling line or low voltage wiring, fiberglass type to be used. Metal fish tapes not allowed.
  5. Secure pull string/tape with minimum 6-feet extended at each end.
  6. Install pull string/tape after conduit is joined and glue is dry.
  7. Provide caps on ends of empty conduit to be used in future.
  8. Label both ends of empty conduits with location of opposite end.
- E. Elbows: Use PVC coated RMC for underground installations.
1. Elbows in utility conduits must be factory made. Field bends or heat bends are not allowed.
- F. When installing utility conduit, 6-inch or smaller, sweeps must be separated by a straight section of at least 5-feet in length and an initial horizontal straight section of at least 3-feet beginning from the vault.
- G. Verify that field measurements are as shown on Drawings.
- H. Plan locations of conduit runs in advance of the installation and coordinate with ductwork, plumbing, ceiling and wall construction in the same areas.
- I. Locate penetrations and holes in advance where they are proposed in the structural sections such as footings, beams, and walls. Penetrations are acceptable only when the following occurs:
1. Where shown on the Structural Drawings.
  2. As approved by the Structural Engineer prior to construction, and after submittal of drawing showing location, size, and position of each penetration.
- J. Verify routing and termination locations of conduit prior to rough-in.
- K. Conduit routing is shown on drawings in approximate locations unless dimensioned. Route as required to complete wiring system.
- L. Install raceways securely, in neat and workmanlike manner, as specified in NECA 1, Standard Practices for Good Workmanship in Electrical Construction.



**SECTION 26 05 33  
RACEWAYS**

**DIVISION 26**

- M. Duct proof all underground conduits to remove dirt and debris and ensure conduit is not obstructed, out-of-round, or collapsed. Utilize a wood test mandrel (or equivalent plastic/hard-rubber) configured for the conduit inside diameter.
- N. Install steel conduit as specified in NECA 101, Standard for Installing Steel Conduits.
- O. Install nonmetallic conduit in accordance with manufacturer's instructions.
- P. Conduit Supports:
  - 1. Arrange supports to prevent misalignment during wiring installation.
  - 2. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
  - 3. Group related conduits; support using conduit rack. Construct rack using steel channel. Provide space on each for 25 percent additional conduits.
  - 4. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.
  - 5. Do not attach conduit to ceiling support wires.
- Q. Flexible metal conduit length not-to-exceed 6-feet, 3-feet in concealed walls. Provide sufficient slack to reduce the effect of vibration.
- R. Install conduit seals at boundaries where ambient temperatures differ by 10 degrees F or more as shown on the drawings. Install seals on warm side of partition.
- S. Seal raceways stubbing up into electrical equipment. Plug raceways with conductors with duct-seal. Cap spare raceways and plug PVC raceway products with plastic plugs as made by Underground Products, or equal, shaped to fit snugly into the stubup.
- T. Seal raceways penetrating an exterior building wall to prevent moisture and vermin from entering into the electrical equipment.
- U. Use suitable caps on spare and empty conduits to protect installed conduit against entrance of dirt and moisture.
- V. Keep emergency system wiring independent of other wiring systems per NEC 700.
- W. Arrange conduit to maintain headroom and present neat appearance.
- X. Do not install conduits on surface of building exterior, along vapor barrier, across roof, on top of parapet walls, or across floors, unless otherwise noted on drawings.
- Y. Exposed conduits are permitted only in following areas:
  - 1. Mechanical rooms, electrical rooms or spaces where walls, ceilings and floors will not be covered with finished material.
  - 2. Existing walls that are concrete or block construction.

- 3. Where specifically noted on Drawings.
- 4. Route exposed conduit parallel and perpendicular to walls, tight to finished surfaces and neatly offset into boxes.
- Z. Do not install conduits or other electrical equipment in obvious passages, doorways, scuttles or crawl spaces which would impede or block area passage's intended usage.
- AA. Install continuous conduit and raceways for electrical power wiring and signal systems wiring.
- BB. Route conduit installed above accessible ceilings parallel and perpendicular to walls.
- CC. Maintain adequate clearance between conduit and piping.
- DD. Keep conduits a minimum of 12-inches away from steam or hot water radiant heating lines (at or above 104 degrees F) or 3-inches away from waste or water lines.
- EE. Cut conduit square using saw or pipecutter; deburr cut ends.
- FF. Bring conduit to shoulder of fittings; fasten securely.
- GG. Use conduit hubs to fasten conduit to cast boxes in damp and wet locations.
- HH. Install no more than the equivalent of three 90 degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams.
- II. Use factory elbows or hydraulic one shot bender to fabricate elbows for bends in metal conduit larger than 2-inch size.
- JJ. Avoid moisture traps.
- KK. Provide suitable fittings to accommodate expansion and deflection where conduit crosses seismic, control, and expansion joints.
- LL. Feeders: Do not combine or change feeder runs.
- MM. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Division 07, Thermal and Moisture Protection.
- NN. Route conduit through roof openings for piping and ductwork wherever possible. Where separate roofing penetration is required, coordinate location and installation method with roofing installation and installer.

### **3.2 RIGID METAL CONDUIT (RMC) INSTALLATION**

- A. Outdoor Locations Above Grade: RMC.
- B. Damp Locations: RMC.
- C. In areas exposed to mechanical damage: RMC.

- D. For security conduits installed exposed and subject to tampering: RMC.

**3.3 POLYVINYL CHLORIDE (PVC) EXTERNALLY COATED GALVANIZED RIGID METAL CONDUIT INSTALLATION**

- A. Use PVC coated RMC 36-inch radius ells for power service conduits.

**3.4 ELECTRICAL METALLIC TUBING (EMT) INSTALLATION**

- A. Dry Locations:
  - 1. Concealed: EMT.
  - 2. Exposed: EMT.
- B. Dry, Protected: EMT.

**3.5 FLEXIBLE METAL CONDUIT (FMC) INSTALLATION**

- A. Dry Locations: Motors, recessed luminaires and equipment connections subject to movement or vibration, use flexible metallic conduit.
- B. Install 12-inch minimum slack loop on flexible metallic conduit.

**3.6 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC) INSTALLATION**

- A. Use PVC coated liquidtight flexible metallic conduit for motors and equipment connections subject to movement or vibration and subjected to any of following conditions: Exterior location, moist or humid atmosphere, corrosive environments, water spray, oil, or grease.
- B. Install 12-inch minimum slack loop on liquidtight flexible metallic conduit.

**3.7 ELECTRICAL POLYVINYL CHLORIDE (PVC) CONDUIT INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Provide equipment grounding conductor in PVC conduit runs containing power conductors.
- C. Underground Installation:
  - 1. Areas subject to vehicular traffic: Schedule 80 PVC.
  - 2. Other underground applications: Schedule 40 PVC, except where prohibited by the NEC or local codes.
- D. Convert PVC conduit to Rigid Metal Conduit (RMC) prior to emerging from underground, concrete encasement, or concrete slab.
- E. PVC elbows are not acceptable. Use PVC coated RMC.

- F. Trim cut ends inside and outside to remove rough edges.
- G. Provide bushings when entering a box, fitting or other enclosure.
- H. Provide all excavation and backfill required to support Division 01 and this Division of work. Coordinate trench specs for concrete, soil or sand backfill.
- I. Excavate trenches 6-inches deeper and wider than ductbank burial and cross-sectional requirements. Remove from the site all excavated materials not suitable or specified for backfill.
- J. Backfill trenches with sand, tamped firm and even to trench depth level.
- K. Backfill with non-expansive soil with limited porosity. Deposit all backfill soil in 6-inch layers. Thoroughly and carefully tamp all backfill soils to 90-95 percent compaction until the ductbank is covered by no less than 12-inches of material. Backfill and tamp the remainder of the excavation at 12-inch intervals. Uniformly grade the finished surface.
- L. Provide sheeting, shoring, dewatering and cleaning required to keep the trenches and their grades in proper condition for the work to be carried on.
- M. Restore all landscape and paving to like-new to match existing.
- N. Slope raceways away from buildings and drain towards manholes or vaults with a minimum slope of 3 percent. Drain raceways into manholes or vaults, not into building structures or panels. Where sloping cannot be fully provided and there is a section of raceway where water would flow to a panel, switchboard, transformer, or building, provide a means to discharge the excess water from the raceway or raceway system, consisting of a box or fitting at a low point prior to equipment entry or at building entry, with a fitting or plug that can be removed to allow drainage.
- O. Cut raceway square using saw or pipe cutter; de-burr cut ends.
- P. Insert raceway to shoulder of fittings; fasten securely.
- Q. Join raceway using adhesive as recommended by manufacturer.
- R. Wipe raceway dry and clean before joining. Apply full even coat of adhesive to entire area inserted into fitting. Allow joint to cure for 20 minutes, minimum.
- S. Number of equivalent 90 degree bends permitted between pull points: Maximum of three bends for power system conduit banks.
- T. Provide suitable fittings to accommodate expansion and deflection where required.
- U. Terminate raceway at manhole entries using end bells.
- V. Use suitable separators and chairs installed not greater than 5-feet on centers.
- W. Provide 1/4-inch polypropylene pull rope in each empty raceway except sleeves and nipples.



- X. Swab raceway. Use suitable caps to protect installed conduit against entrance of dirt and moisture.
- Y. Interface installation of underground warning tape with backfilling. Install tape 6-inches below finished surface.

### **3.8 CONDUIT FITTINGS INSTALLATION**

- A. Conduit Joints: Assemble conduits continuous and secure to boxes, panels, luminaires and equipment with fittings to maintain continuity. Provide watertight joints where embedded in concrete, below grade or in damp locations. Seal metal conduit with metal thread primer. Rigid conduit connections to be threaded, clean and tight (metal to metal). Threadless connections are not permitted for RMC.
- B. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.
- C. Use set screw type fittings only in dry locations. When set screw fittings are utilized provide insulated continuous equipment ground conductor in conduit, from overcurrent protection device to outlet.
- D. Use compression fittings in dry locations, damp and rain-exposed locations. Maximum size permitted in damp locations and locations exposed to rain is 2-inches in diameter.
- E. Use threaded type fittings in wet locations, and damp or rain-exposed locations where conduit size is greater than 2-inches.
- F. Use PVC coated, threaded type fittings in corrosive environments.
- G. Use insulated type bushings with ground provision at switchboards, panelboards, safety disconnect switches, junction boxes that have feeders 60 amperes and greater.
- H. Condulets and Conduit Bodies:
  - 1. Do not use condulets and conduit bodies in conduits for signal wiring, in feeders 100 amp and larger, or for conductor splicing.
- I. Sleeves and Chases - Floor, Ceiling and Wall Penetrations: Provide necessary conduit sleeves, openings and chases where conduits or cables are required to pass through floors, ceilings, or walls.
- J. Provide rigid conduit coupling flush with surface of slab or wall for conduit stubbed in concrete slab or wall to serve electrical equipment or an outlet under table or to supply shop tool, etc. Provide plug where conduit is to be used in future.

**END OF SECTION**

**SECTION 26 05 34  
BOXES**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Work Included:
  - 1. Outlet Boxes
  - 2. Floor Boxes
  - 3. Pull and Junction Boxes
  - 4. Box Extension Adapter
  - 5. Weatherproof Outlet Boxes
- B. Provide electrical boxes and fittings for a complete installation. Include but not limited to outlet boxes, junction boxes, pull boxes, bushings, locknuts and other necessary components.

**1.2 RELATED SECTIONS**

- A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.
- B. In addition, reference the following:
  - 1. Section 26 05 33, Raceways
  - 2. Section 26 05 53, Identification for Electrical Systems

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

**1.4 SUBMITTALS**

- A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

**1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

**1.6 WARRANTY**

- A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.



**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

**A. Outlet Boxes:**

1. Hubbell
2. Thomas & Betts
3. Eaton/Crouse-Hinds
4. Or approved equivalent.

**B. Floor Boxes:**

1. Legrand (Wiremold)
2. FSR
3. Hubbell
4. Thomas & Betts
5. MonoSystems
6. Eaton/Crouse-Hinds
7. Or approved equivalent.

**C. Pull and Junction Boxes:**

1. Eaton/Crouse-Hinds
2. Hoffman
3. Or approved equivalent.

**D. Box Extension Adapter:**

1. Hubbell
2. Thomas & Betts
3. Eaton/Crouse-Hinds
4. Or approved equivalent.

**E. Weatherproof Outlet Boxes:**

1. Legrand (Pass & Seymour)

2. Hubbell
3. Thomas & Betts
4. Eaton/Crouse-Hinds
5. Intermatic
6. Or approved equivalent.

## **2.2 OUTLET BOXES**

- A. Luminaire Outlet: 4-inch octagonal box, 1-1/2-inches deep with 3/8-inch luminaire stud if required. Provide raised covers on bracket outlets and on ceiling outlets.
- B. Device Outlet: Installation of one or two devices at common location, minimum 4-inches square, minimum 1-1/2-inches deep for non-USB type devices.
- C. Multiple Devices: Three or more devices at common location. Install one-piece gang boxes with one-piece device cover. Install one device per gang.
- D. Masonry Boxes: Outlets in concrete.
- E. Construction: For interior locations, provide galvanized steel outlet wiring boxes, of the type, shape and size, including depth of box, to suit each respective location and installation; constructed with stamped knockouts in back and sides, and with threaded holes with screws for securing box covers or wiring devices. All surface mounted outlet boxes are to be drawn. Welded boxes are not acceptable.
- F. Accessories: Provide outlet box accessories for each installation, including mounting brackets, wallboard hangers, extension rings, luminaire studs, cable clamps and metal straps for supporting outlet boxes, compatible with outlet boxes being used and meeting requirements of individual wiring situations.
- G. Noise Control: Provide acoustic putty pad to back side of each outlet box installed in acoustic rated walls.

## **2.3 FLOOR BOXES**

- A. Basis of Design: Floor boxes are based on Legrand/Wiremold as the manufacturer. Manufacturers are approved for use on this project on condition of meeting or exceeding basis of design for conditions of use, box capacity, total allowed connecting conduit capacity, and available finishes. Products ordered or installed not meeting basis of design are subject to removal and replacement at no cost to Owner.
- B. Floor Boxes:
  1. Multi-Gang Box, Slab on Grade: Cast iron housing rated for slab on grade application, fully adjustable, accepts up to 1.25-inch conduits. Rubber gasket protects interior from water and debris. 2-gang. Provide with two duplex receptacle(s) and activations for four telecom/AV outlets. Rectangular activation,

flanged, for use with matching carpet or tile insert. Finish: aluminum.  
Legrand/Wiremold RFB2-OG or approved.

#### **2.4 PULL AND JUNCTION BOXES**

- A. Construction: Provide ANSI 61 gray polyester powder painted sheet steel junction and pull boxes, with screw-on covers; of type shape and size, to suit each respective location and installation; with welded seams and equipped with stainless steel nuts, bolts, screws and washers.
- B. Location:
  - 1. Provide junction boxes above accessible ceilings for drops into walls for receptacle outlets from overhead.
  - 2. Provide junction boxes and pull boxes to facilitate installation of conductors and limiting accumulated angular sum of bends between boxes, cabinets and appliances to 270 degrees.
- C. In-Ground Cast Metal Box: NEMA 250, Type 6, outside flanged, recessed cover box for flush mounting.
  - 1. Construction: Galvanized cast iron.
  - 2. Cover: Smooth cover with neoprene gasket and stainless steel cover screws.
  - 3. Cover Legend: ELECTRIC.
- D. Fiberglass Handholes: Die molded glass fiber hand holes:
  - 1. Cable Entrance: Pre-cut 6- by 6-inch cable entrance at center bottom of each side.
  - 2. Cover: Fiberglass weatherproof cover with nonskid finish.
  - 3. Cover Legend: ELECTRIC.

#### **2.5 BOX EXTENSION ADAPTER**

- A. Construction: Diecast aluminum.
- B. Location: Install over flush wall outlet boxes to permit flexible raceway extension from flush outlet to fixed or movable equipment.

#### **2.6 WEATHERPROOF OUTLET BOXES**

- A. Construction: Provide corrosion-resistant cast metal weatherproof outlet wiring boxes, of the type, shape and size, including depth of box, with threaded conduit ends, cast metal faceplate with spring-hinged waterproof cap suitably configured for each application, including faceplate, gasket, blank plugs and corrosion proof fasteners. Weatherproof boxes to be constructed to have smooth sides, gray finish.

**PART 3 - EXECUTION**

**3.1 GENERAL INSTALLATION REQUIREMENTS**

- A. Coordinate locations of floor boxes and wall mounted wiring device boxes with architectural and structural floor plans prior to rough-in.
- B. Install boxes securely, in a neat and workmanlike manner, as specified in NECA 1, Standard Practice of Good Workmanship in Electrical Construction.
- C. Secure boxes rigidly to substrate upon which they are being mounted, or solidly embed boxes in concrete or masonry.
- D. Install in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and as required by NEC. Locate boxes and conduit bodies so as to ensure accessibility of electrical wiring.
- E. Set wall mounted boxes at elevations to accommodate mounting heights shown on Architectural Elevations.
- F. Electrical boxes are shown on drawings in approximate locations unless dimensioned.
  - 1. Adjust box locations up to 10-feet if required to accommodate intended purpose.
- G. Install boxes to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Division 07, Thermal and Moisture Protection.
- H. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.
- I. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
- J. Support boxes independently of conduit, except cast box that is connected to two rigid metal conduits both supported within 12-inches of box.
- K. Box Color Coding and Marking: Reference Section 26 05 53, Identification for Electrical Systems.
- L. Adjust boxes to be parallel with building lines. Boxes not plumb to building lines are not acceptable.
- M. Install knockout closures in unused box openings.
- N. Clean interior of boxes to remove dust, debris, and other material.
- O. Clean exposed surfaces and restore finish.

**3.2 OUTLET BOXES INSTALLATION**

- A. Mount outlet boxes, unless otherwise required by ADA, or noted on Drawings, following distances above finished floor:

1. Control Switches:
    - a. 48-inches to the top of outlet box.
    - b. 4-inches above top of backsplash at countertops/workstations, not to exceed 44-inches above finished floor to the top of outlet box, per ADA requirements.
  2. Receptacles:
    - a. 15-inches to the bottom of outlet box.
    - b. 4-inches above top of backsplash at countertops/workstations, not to exceed 44-inches above finished floor to the top of outlet box, per ADA requirements.
  3. Other Outlets: As indicated in other sections of Specifications or as detailed on Drawings.
- B. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6-inches from ceiling access panel or from removable recessed luminaire.
- C. Flush Outlets in Insulated Spaces: Maintain integrity of insulation and vapor barrier.
- D. Coordinate electrical device locations and elevations (switches and receptacles) with architectural drawings to prevent mounting devices in mirrors, back splashes, and behind cabinets.
- E. Locate outlet boxes to allow luminaires positioned as shown on reflected ceiling plan.
- F. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices. Adjacent boxes not aligned vertically to be adjusted at no additional cost to Owner.
- G. Use flush mounting outlet box in finished areas.
- H. Do not install flush mounting box back-to-back in walls; provide minimum 6-inches separation. Provide minimum 24-inches in acoustic rated walls.
- I. In acoustical walls, apply acoustic putty pad on outlet box prior to installation of acoustical blanket.
- J. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
- K. Use stamped steel bridges to fasten flush mounting outlet box between studs.
- L. Use adjustable steel channel fasteners for hung ceiling outlet box.
- M. Use gang box where more than one device is mounted together. Do not use sectional box.
- N. Use gang box with plaster ring for single device outlets.

- O. Adjust flush-mounting outlets to make front flush with finished wall material.

### **3.3 FLOOR BOXES INSTALLATION**

- A. Use cast floor boxes for installations in slab on grade.
- B. Use steel boxes matching fire-rating of floor slab for slab above grade.
- C. Set floor boxes level.
- D. Adjust floor boxes flush with finish flooring material.
- E. Provide sufficient concrete cover around floor box to maintain fire rating of floor slab for slab above grade, and meet manufacturer installation directions for floor box on grade.

### **3.4 PULL AND JUNCTION BOXES INSTALLATION**

- A. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
- B. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6-inches from ceiling access panel or from removable recessed luminaire.
- C. Do not fasten boxes to ceiling support wires.
- D. Large Pull Boxes: Use hinged enclosure in interior dry locations, surface-mounted cast metal box in other locations.

### **3.5 BOX EXTENSION ADAPTER INSTALLATION**

- A. Match material to box.
- B. Install gaskets at exterior and wet locations.

### **3.6 WEATHERPROOF OUTLET BOXES INSTALLATION**

- A. Use cast outlet box in exterior locations exposed to weather and wet locations.
- B. Install gaskets.

**END OF SECTION**



**SECTION 26 05 53  
IDENTIFICATION FOR ELECTRICAL SYSTEMS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Work Included:
  - 1. Equipment Nameplates
  - 2. Device Labels
  - 3. Wire Markers
  - 4. Underground Warning Tape

**1.2 RELATED SECTIONS**

- A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

**1.4 SUBMITTALS**

- A. Submittals not required for this Section.

**1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.
- B. In addition, meet the following:
  - 1. Manufacturer's Qualifications: Firms regularly engaged in manufacture of identification devices of types and sizes required.
  - 2. Manufacturer's standard products of categories and types required for each application as referenced in other Division 26, Electrical Sections. Where more than a single type is specified for application, provide single selection for each product category.
  - 3. Codes and Standards: Comply with ANSI A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices unless otherwise indicated.



**SECTION 26 05 53  
IDENTIFICATION FOR  
ELECTRICAL SYSTEMS**

**DIVISION 26**

**1.6 WARRANTY**

- A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Equipment Nameplates:
1. B & I Nameplates
  2. Intellicum
  3. JBR Associates
  4. Or approved equivalent.
- B. Device Labels:
1. Kroy
  2. Brady
  3. Or approved equivalent.
- C. Wire Markers:
1. Brady
  2. Panduit
  3. Sumitomo
  4. Or approved equivalent.
- D. Underground Warning Tape:
1. Allen Systems
  2. Brady
  3. Or approved equivalent.

**2.2 EQUIPMENT NAMEPLATES**

- A. Engraved phenolic plastic, laminate, minimum 1/16-inch thick in the size indicated, with beveled edge border matching letter color. Federal specification LP-387A. All upper case letters in engraver standard letter style of the size and wording indicated. Provide with 2-mil adhesive backing. Embossed tape style labels are not acceptable.



**SECTION 26 05 53  
IDENTIFICATION FOR  
ELECTRICAL SYSTEMS**

**DIVISION 26**

- B. Color:
1. Normal (Utility): White letters on black background.
  2. Life Safety/Critical (Emergency Systems): Black letters on red background.
  3. Equipment Branch (Legally Required Standby Systems): Black letters on yellow background.
- C. Letter Size:
1. Use 1/2-inch letters minimum for identifying major equipment and loads, including switchboards, distribution panels, etc.
  2. Use 1/4-inch or 1/2-inch letters minimum for identifying panels, breakers, transformers, disconnects, etc.
  3. Use 3/16-inch minimum for identifying source, voltage, current, phase, wire configurations, and short circuit current rating (SCCR).
- D. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate the substrate.
- E. The Architect, Engineer, and Owner reserve the right to make modifications to the nameplates as necessary.
- F. Locations:
1. Switchboards, branch panels.
  2. Main breakers and distribution breakers in switchgear, switchboards, and distribution panels.
  3. Equipment including, but not limited to, motor controllers, and disconnects.
  4. Low-voltage equipment enclosures including, but not limited to, fire alarm panels, access control panels, and lighting control panels.

**2.3 DEVICE LABELS**

- A. Extra strength, laminated adhesive tape with 3/16-inch black letters on clear background. Embossed tape/punch tape style labels are not acceptable.
- B. Receptacles: Indicate source panel and source circuits (e.g. xxx-xx).
- C. Wall Switches/Control Device Stations:
1. Where controls are provided for remote lighting or power outlets, or where controls in same location serve different purposes or areas, such as corridor and outside, provide device label indicating function of each control device.



## SECTION 26 05 53 IDENTIFICATION FOR ELECTRICAL SYSTEMS

### DIVISION 26

2. Label the function of control devices where two or more are mounted in same location and control function may be unclear.
3. Wall switches with engraved buttons do not require labeling.
- D. Junction Boxes: Label to show system identification, source circuit, or raceway origin. In finished areas, utilize device label. In unfinished areas or above ceilings, use of permanent ink marker is acceptable.
- E. Panel and circuit designation written in permanent marker on the back of the plate and inside all back-boxes and junction boxes.

#### 2.4 WIRE MARKERS

- A. Description: Vinyl-cloth self-adhesive type wire markers.
- B. Locations: Each conductor at panelboard gutters, pull boxes, outlet boxes, junction boxes, and each load connection.
- C. Power and Lighting Circuits: Branch circuit or feeder number as indicated on drawings and source panel.
- D. Control Circuits: control wire number indicated on schematic and interconnection diagrams on drawings or shop drawings.

#### 2.5 UNDERGROUND WARNING TAPE

- A. Description: 6-inch wide inert polyethylene plastic tape, 4-mil thick, detectable type, colored per APWA recommendations unless otherwise noted with suitable warning legend describing buried electrical lines.

### PART 3 - EXECUTION

#### 3.1 GENERAL INSTALLATION REQUIREMENTS

- A. Coordinate designations used on Drawings with equipment nameplates and device labels.
- B. Install nameplates and labels parallel to equipment lines.
- C. Identify empty conduit and boxes with intended use.
- D. Provide typewritten branch panel schedules with protective clear transparent covers accounting for every breaker installed. Use actual room designations assigned by name or number near completion of the work, and not the designations shown on Drawings.

#### 3.2 EQUIPMENT NAMEPLATES

- A. Degrease and clean surfaces to receive nameplates.
- B. Secure equipment nameplates to equipment front using manufacturer adhesive backing.



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- C. Secure equipment nameplates to inside surface of door on panelboard that is recessed in finished locations.
- D. Verify emergency system distribution equipment nameplate colors with Architect/Owner.
- E. Switchboards and branch panels to include name, source, voltage, current, phase, wire configuration, and short circuit current rating (SCCR).
- F. Disconnect switches to include name, source, and circuit number.
- G. Provide nameplates for flush mounted branch panelboards identifying name on front door. On inside of door provide nameplate as noted above. Verify with Architect/Owner if nameplate on outside of door is required.
- H. Provide a second label at branch panelboards listing the means of identification of branch circuit conductors. This identification legend to consist of the color code used for each voltage system (208Y/120V and 480Y/277V). Include identification of both voltage systems on each label, regardless of the voltage of the panelboard to which the label is affixed. Comply with requirements of NEC 210.5.
  - 1. See Specification Section 26 05 19, Low-Voltage Electrical Power Conductors and Cables, for required conductor color code for this project.

**3.3 DEVICE LABELS**

- A. Reference General Installation Requirements above.
- B. Install per manufacturer's instructions and recommendations.
- C. Degrease and clean surfaces to receive labels. Fingers to be regularly cleaned of grease and debris to prevent fingerprints on labels. Labels installed dirty or with fingerprints to be replaced at no cost to Owner.

**3.4 WIRE MARKERS**

- A. Reference General Installation Requirements above.
- B. Install per manufacturer's instructions and recommendations.
- C. Provide wire markers on each conductor for power, control, signalling and communications circuits.

**3.5 UNDERGROUND WARNING TAPE**

- A. Reference General Installation Requirements above.
- B. Install per manufacturer's instructions and recommendations.
- C. Identify underground raceways using underground warning tape. Install one continuous tape per underground raceway at 6- to 8-inches below finish grade. Where multiple underground raceways are buried in a common trench and exceeds 16-inch width, install



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multiple warning tapes not over 10-inches apart (edge to edge) over the entire group of underground raceways.

**END OF SECTION**

**SECTION 26 05 73  
ELECTRICAL DISTRIBUTION SYSTEM STUDIES**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Work Included:
  - 1. Protective Devices
  - 2. Short Circuit Study
  - 3. Arc Flash Risk Assessment
  - 4. Arc Flash Labels

**1.2 RELATED SECTIONS**

- A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.
- B. In addition, reference the following:
  - 1. Section 26 24 13, Switchboards
  - 2. Section 26 24 16, Panelboards
  - 3. Section 26 28 00, Overcurrent Protective Devices
  - 4. Section 26 28 16, Enclosed Switches and Circuit Breakers

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.
- B. In addition, meet the following:
  - 1. IEEE 242, Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems.
  - 2. IEEE 399, Recommended Practice for Industrial and Commercial Power Systems Analysis.
  - 3. IEEE 1584, Guide for Performing Arc Flash Calculation.

**1.4 SUBMITTALS**

- A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.
- B. In addition provide:



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1. Power system studies required under this Section with submittals for electrical equipment, including overcurrent protective devices.
2. Electrical equipment ordered prior to submittal of power system studies are not compliant with these specifications, and are subject to removal and replacement at no cost to Owner where not in compliance with Code and Contract Documents for selective coordination.
  - a. Provide written verification with Stamp or Seal and signature of preparing Engineer.
3. Provide samples of NFPA 70E compliant arc flash hazard labeling for electrical equipment.

**1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.
- B. In addition, meet the following:
  1. Study Preparer Qualifications: Qualified engineer of switchgear manufacturer or approved professional engineer.
    - a. Experienced in preparation of studies of similar type and magnitude.
    - b. Familiar with software analysis products specified.
  2. Computer Software for Study Preparation: Use latest edition of commercially available software utilizing specified methodologies.
    - a. Acceptable Software Products:
      - 1) EasyPower
      - 2) Operation Technology, Inc; ETAP.
      - 3) SKM Systems Analysis, Inc; Power Tools for Windows.
    - b. The above manufacturers are known to be acceptable for study purposes. At the completion of the study, provide an electronic EasyPower file of the project to the Owner/Engineer. The file is to include all files required to edit and evaluate the electronic model, including libraries, one-lines, scenarios, TCC curves and all reports.
  3. Contractor Responsibility: Provide project-related data needed by study preparer, including equipment, wire sizes, insulation types, conduit types, actual circuit lengths and available fault currents from utility. Provide information in a timely matter to allow studies to be completed prior to release of equipment.





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#### **1.6 WARRANTY**

- A. Warranty of materials and workmanship as required by 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

#### **PART 2 - PRODUCTS**

##### **2.1 GENERAL**

- A. Analyze specific electrical and utilization equipment (according to NEC definition), actual protective devices to be used, and actual feeder lengths to be installed.
  - 1. Scope of Studies: New distribution wiring and equipment, from primary source to buses, branch circuit panelboards and equipment rated 50A or larger at utilization voltage.
  - 2. Primary Source, for Purposes of Studies: Utility company transformer secondary.
  - 3. Study Methodology: Comply with requirements and recommendations of NFPA 70, IEEE 399, and IEEE 242.
  - 4. Report: State methodology and rationale employed in making each type of calculation; identify computer software package(s) used.
- B. One-Line Diagrams: Prepare schematic drawing of electrical distribution system, with electrical equipment and wiring to be protected by protective devices; identify nodes on diagrams for reference on report that includes:
  - 1. Calculated fault impedance, X/R ratios, utility contribution, and short circuit values (asymmetric and symmetric) at main switchboard bus and downstream devices containing protective devices.
  - 2. Breaker and fuse ratings.
  - 3. Identification of each bus, with voltage.
  - 4. Conduit materials, feeder sizes, actual lengths, and X/R ratios.

##### **2.2 PROTECTIVE DEVICES**

- A. Provide protective devices of ratings and settings as required so that protective device closest to fault will open first.
- B. Analyze and determine ratings and settings of protective devices to minimize damage caused by fault and so that protective device closest to fault will open first.
  - 1. Required Ratings and Settings: Derive required ratings and settings of protective devices in consideration of upstream protective device settings and optimize system to ensure selective coordination.



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2. Motors with Solid-State Protective Modules: Select settings for best possible motor protection, taking into consideration actual installed motor torque and current and thermal characteristics.
  3. Identify any equipment, both new and existing, that is underrated.
  4. Identify specified protective devices that will not achieve required protection or coordination but with minor changes can be made to do so; provide such modified devices at no additional cost to Owner and identify them on submittals as "revised in accordance with Protective Device Coordination Study"; minor changes include different trip sizes in same frame, time curve characteristics of induction relays, CT ranges, etc.
  5. Identify specified protective devices that will not achieve required protection or coordination and cannot be field adjusted to do so, and for which adequate devices would involve change to contract sum.
  6. In all cases where adequate protection or coordination cannot be achieved at no extra cost to Owner, provide a discussion of alternatives and logical compromises for best achievable coordination.
  7. Do not order, furnish, or install protective devices that do not meet performance requirements unless specifically approved by Engineer.
- C. Protective Device Rating and Setting Chart: Summarize in tabular format required characteristics for each protective device based on analysis; include:
1. Device identification.
  2. Relay CT ratios, tap, time dial, and instantaneous pickup.
  3. Circuit breaker sensor rating, long-time, short-time, and instantaneous settings, and time bands.
  4. Fuse rating and type.
  5. Ground fault pickup and time delay.
  6. Input level and expected response time at two test points that are compatible with commonly available test equipment and ratings of protective device.
  7. Highlight devices that as furnished by Contractor will not achieve required protection.
- D. Specified equipment has been designed and selected to achieve specified performance; ensure that equipment actually installed provides that performance.
- E. In addition to requirements specified elsewhere, provide overcurrent protective devices having ratings and settings in accordance with results of system studies.



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### **2.3 SHORT CIRCUIT STUDY**

- A. Calculate fault impedance to determine available 3-phase short circuit and ground fault currents at each bus and piece of equipment during normal conditions, alternate operations, emergency power conditions, and other operations that could result in maximum fault conditions.
  - 1. Show fault currents available at key points in system down to fault current of 1,000A at 208V.
  - 2. Include motor contributions in determining momentary and interrupting ratings of protective devices.
  - 3. Primary Fault Level Assumptions: Obtain data from utility company.

### **2.4 ARC FLASH RISK ASSESSMENT**

- A. Calculate arc flash incident energy (AFIE) levels and flash protection boundary distances to determine required level of personal protective equipment (PPE) at each bus and piece of equipment during normal conditions, emergency power conditions, and other operations that could result in maximum arc flash incident energy levels.
  - 1. Show flash protection boundary distance.
  - 2. Include incident energy levels.

### **2.5 ARC FLASH LABELS**

- A. Provide label compliant with NFPA 70E guidelines indicating personal protective equipment (PPE) recommended for servicing of electrical equipment while energized, as well as calculated incident energy levels and arc flash protective boundary distance.

## **PART 3 - EXECUTION**

### **3.1 FIELD QUALITY CONTROL**

- A. Provide services of qualified field engineer and necessary tools and equipment to test, calibrate, and adjust installed protective devices to conform to requirements determined by coordination analysis.
- B. Adjust installed protective devices having adjustable settings to conform to requirements determined by coordination analysis.
- C. Submit report showing final adjusted settings of protective devices.

### **3.2 ELECTRICAL POWER SYSTEM STUDIES**

- A. Short Circuit Analysis Study:
  - 1. Provide complete short circuit study, equipment interrupting and withstand evaluation. Study to include complete electrical distribution system, including



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contributions from normal source of power without alternative sources of power. Include complete low voltage distribution systems as specified in this Section.

2. Study Basis: thoroughly cover normal and alternative operation modes that can produce maximum fault conditions, including simultaneous motor contributions.
3. Perform study in accordance with applicable ANSI/IEEE Standards.
4. Study Input Data: Utility company short circuit single and three phase contribution, and X/R ratio; resistance and reactance components of each feeder, busway and branch impedance; motor and generator contributions; applicable circuit parameters and contribute to short circuit duty.
5. Calculate short circuit momentary duties and interrupting duties on basis of maximum available fault current at each switchgear bus, switchboard, motor control center, panelboard, transfer switch, busway plug, dry-type transformer primary and secondary and other significant locations throughout system affected by available fault current (including large equipment, disconnects, control panels, uninterruptible power supplies, etc.).
6. Perform equipment evaluation study to determine adequacy of overcurrent protection devices by tabulating and comparing short circuit ratings of these devices with available fault current. Notify Owner in writing where problem areas or inadequacies appear in electrical equipment.
7. Study Report: In bound final report, include sheets listing tabulated information from study, including feeder impedances, motor, utility and generator impedances and fault contributions, and resulting short circuit current including asymmetrical, symmetrical, three, five and eight cycle fault current levels, and line-to-neutral and three-phase-bolted-fault current levels at each calculated point in electrical distribution system.

**B. Arc Flash Risk Assessment:**

1. Perform arc flash risk assessment with aid of computer software intended for this purpose.
2. Perform arc flash risk assessment in conjunction with short-circuit analysis and time-current coordination analysis.
3. Submit results of assessment in tabular form, and include device or bus name, bolted fault and arcing fault current levels, flash protection boundary distances, personal-protective equipment classes and AFIE levels.
4. Perform analysis under worst-case arc flash conditions, and final report describes, when applicable, how these conditions differ from worst-case bolted fault conditions.
5. Arc flash risk assessment includes recommendations for reducing AFIE levels and enhancing worker safety.



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6. Proposed vendor demonstrates experience with arc flash risk assessment by submitting names of at least ten actual arc flash risk assessments it has performed in past year.
7. Proposed vendor demonstrates capabilities in providing equipment, services, and training to reduce arc flash exposure and train workers in accordance with NFPA 70E and other applicable standards.
8. Proposed vendor demonstrates experience in providing equipment labels in compliance with CEC and ANSI Z535.4 to identify AFIE and appropriate Personal Protective Equipment classes.

**END OF SECTION**

**SECTION 26 08 05  
ELECTRICAL ACCEPTANCE TESTING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Work included: Testing, evaluation, and calibration of:
  - 1. Power Distribution Equipment
- B. Test procedures specified in this Section are in addition to those specified in other Sections of Division 26, Electrical.

**1.2 RELATED SECTIONS**

- A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.
- B. In addition, meet the following:
  - 1. Acceptance Testing Criteria: Latest edition of Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems, published by NETA.

**1.4 SUBMITTALS**

- A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.
- B. In addition, provide:
  - 1. Quality Assurance Submittal: Submit proof of qualification that Testing Firm meets all requirements set forth in this Section. Refer to Part 1, Quality Assurance, below.
  - 2. Test Reports:
    - a. Maintain written record of tests.
    - b. At completion of project, assemble and certify a final test report. Document testing and performance compliance with NETA recommended forms, parameters, and level of detail. Submit report to Architect prior to final acceptance to include:
      - 1) Summary of Project
      - 2) Description of Equipment Tested



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- 3) Visual Inspection Report
- 4) Description of Tests
- 5) Test Results
- 6) Conclusions and Recommendations

**1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.
- B. In addition, meet the following:
  1. Qualifications of Testing Firm:
    - a. Corporately independent testing organization which can function as an unbiased testing authority, professionally independent of manufacturers, suppliers and installers of equipment or systems evaluated by testing firms.
    - b. Independent organization as defined by a NETA Level II ETT certified testing agency in compliance with NETA Level II ETT certified testing requirements and practices.
    - c. Regularly engaged in testing of electrical materials, devices, appliances, electrical installations and systems for purpose of preventing injury to persons or damage to property and other equipment.
    - d. Engaged in testing practices for minimum of five years.
    - e. Use only full-time technicians, regularly employed by firm for testing services. Electrically unskilled employees are not permitted to perform testing or assistance of any kind. Electricians and line workers may assist, but may not perform testing or inspection services.
  2. Certifications:
    - a. Comply with NETA Level II ETT certified testing agency criteria for accreditation of testing laboratories. Full membership in NETA constitutes proof of such criteria.
    - b. Lead, on site, technical person currently certified by NETA in Electrical Power Distribution System Testing.
    - c. Instruments used by testing firm to evaluate electrical performance meet NETA Specifications for Test Instruments.



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**1.6 PERFORMANCE REQUIREMENTS**

- A. Retain services of recognized independent testing firm for purpose of performing inspections and tests as specified.
- B. Independent test firm providing report direct to Architect.
- C. Material, equipment, labor and technical supervision to perform tests and inspections provided by testing firm.
- D. Intent of these tests to assure that electrical equipment, Contractor or Owner supplied, is operational within industry and manufacturer's tolerances and is installed in accordance with design Specifications.
- E. Tests and inspections determine suitability for energization.
- F. Supply to independent testing organization complete sets of approved shop drawings, coordination study (provided by Contractor's equipment supplier under Contractor's direction), setting of adjustable devices and other information requested by testing agency.

**1.7 SCOPE OF WORK**

- A. Provide testing, evaluation, and calibration of the following:
  - 1. Low Voltage Circuit Breakers (greater than 100 amp)
  - 2. Switchboards
  - 3. Panelboards
- B. Test cable, equipment and systems listed above to assure proper installation, setting, connections, and functioning in accordance with the Drawings, Specifications, and the manufacturer's recommendations. It is the intent that field testing be extensive, and complete as specified, to provide positive assurance of totally correct installation and operation of equipment.
- C. Furnish necessary test equipment to satisfactorily perform tests specified.

**PART 2 - PRODUCTS**

**2.1 POWER DISTRIBUTION EQUIPMENT**

- A. The testing agency provides test equipment.
- B. Care and Precautions:
  - 1. Contractor responsible for any damage to equipment or material due to improper test procedures or test apparatus handling. Replace or restore to original condition any damaged equipment or material.





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2. Provide and use safety devices such as rubber gloves and blankets, protective screen, barriers and danger signs to adequately protect and warn personnel in the vicinity of the tests.
3. Use test equipment that is calibrated and certified traceable to the National Bureau of Standards. Certification Date: No later than 6 months.

**PART 3 - EXECUTION**

**3.1 FIELD QUALITY CONTROL**

- A. Tests:
  1. Contractor's Responsibilities:
    - a. Perform routine insulation resistance, continuity and rotation tests for distribution and utilization equipment prior to and in addition to tests performed by testing firm.
    - b. Notify testing firm when equipment becomes available for acceptance tests. Coordinate work to expedite project scheduling.
  2. Testing Firm's Responsibilities:
    - a. Notify Architect prior to commencement of any testing.
    - b. Report directly to Architect any systems, material or installation found defective on basis of acceptance tests.
    - c. Provide auxiliary portable power supply necessary for conducting tests.

**3.2 REPLACEMENT OF DEFECTIVE MATERIAL OR EQUIPMENT**

- A. Repair or replace any material or equipment found defective or cannot pass the tests specified in this Section at no additional cost to the Owner.
- B. Complete correction of defective material or equipment and retesting within the Contract period.
- C. If the equipment or material cannot pass the second test, remove the defective equipment and replace it with equivalent equipment that meets the requirements of the Specifications. Such replacement at no additional cost to the Owner.

**3.3 ADJUSTING**

- A. Final Settings: Testing firm responsible for implementing final settings and adjustments on protective devices and tap changes in accordance with Architect's specified values.

**END OF SECTION**

**SECTION 26 08 10  
BUILDING LIGHTING ACCEPTANCE TESTING AND DOCUMENTATION**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Work Included:
  - 1. Duties of the Team
  - 2. Time Schedule
  - 3. Acceptance Testing - Phase I - Documentation
  - 4. Acceptance Testing - Phase II - Inspection and Testing
  - 5. Acceptance Testing - Phase III - Certification
- B. This Section describes the acceptance testing and documentation of the lighting system(s) and outlines the duties and responsibilities of the contracting team for acceptance testing.
- C. Supply the acceptance requirements to products, equipment and systems provided under this Division, where indicated on Drawings.
- D. Engage the services of a firm specializing in commissioning of lighting systems or submit contractor qualifications for review by architect where testing and documentation is to be performed by contractor.

**1.2 RELATED SECTIONS**

- A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

**1.4 SUBMITTALS**

- A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

**1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

**1.6 COMMISSIONING TEAM**

- A. Form the Commissioning Team of:



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1. Electrical Contractor's Representative
2. Lighting Controls Manufacturer's Representative
3. Inspector of Record
4. Owner's Staff Representative

**PART 2 - PRODUCTS - NOT USED**

**PART 3 - EXECUTION**

**3.1 DUTIES OF THE TEAM**

- A. The duties of the Team are as outlined in the International Energy Conservation Code (IECC) requirements and summarized below:
  1. Plan, organize, and implement the acceptance testing process and within one month of the award of the contract; submit the names and addresses of the Testing team member(s).
  2. The acceptance testing team to submit a complete description of the testing procedures and systems to be tested to the architect for review.
  3. The acceptance testing team to coordinate tests of systems and equipment and assemble documentation related to tests. Submit documentation relative to tests and proposed procedures to design engineer for review prior to submitting documentation to Authority Having Jurisdiction (AHJ). Team responsible for performing data analysis, calculation of performance indices and cross-checking of results with the requirements of California Title 24 and the Contract documents. The installing contractor or agent responsible for testing and documentation to record their State of California Contractor's license number, or their State of California Professional Registration License number on each Certificate of Acceptance for submittal.
  4. Responsible for submitting Certificate of Acceptance including paper and electronic copies of measurements and monitoring results and supporting documentation to the AHJ. Where AHJ questions results or requires additional testing, complete additional testing and provide required documentation at no additional cost to the Owner.

**3.2 TIME SCHEDULE**

- A. Determine the time period of the commissioning of the systems by the general contractor and acceptance testing team. It is important to note that AHJ will not release a final Certificate of Occupancy until a Certificate of Acceptance is submitted that demonstrates that the specified systems and equipment have been shown to be performing in accordance with the State of California standards.

**3.3 ACCEPTANCE TESTING - PHASE I - DOCUMENTATION**

- A. Team to assemble documentation showing lighting fixture locations, lighting control device locations, control sequences and notes.



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- B. Per State of California requirements, team to provide record drawings to building Owner within 90 days of receiving a final occupancy permit (reference other specification Sections for requirements on record drawings).
- C. Per State of California requirements, team to provide operating and maintenance manuals to the building Owner (reference other specification Sections for requirements on operation and maintenance manuals).

**3.4 ACCEPTANCE TESTING - PHASE II - INSPECTION AND TESTING**

- A. Team to review the installation, perform acceptance testing and document results for the following systems:
  - 1. Occupancy Sensors
  - 2. Automatic Time Switch Controls
- B. Review of installation to confirm lighting fixtures and lighting controls are properly located, identified, calibrated, and set points and schedules programmed per contract document requirements.

**3.5 ACCEPTANCE TESTING - PHASE III - CERTIFICATION**

- A. Team to document operating and maintenance information, complete installation certificate, and indicate test results on the Certificate of Acceptance, and submit the Certificate to the AHJ prior to receiving final occupancy permit.

**3.6 ACCEPTANCE TESTS AND DOCUMENTATION**

- A. Reference State of California requirements for specific testing procedures and documentation requirements. Contractor is responsible for reviewing and complying with standards as required by Division 01, General Requirements and Section 26 00 00, Electrical Basic Requirements as well as State and governmental standards related to this work.

**END OF SECTION**

**SECTION 26 09 25  
DIGITAL LIGHTING CONTROLS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

A. Work included:

1. General Performance
2. Digital Wall or Ceiling Mounted Occupancy Sensor System
3. Digital Wall Switches
4. Room Controllers
5. Room Network (DLM Local Network)
6. Configuration Tools
7. Network Bridge
8. Segment Manager
9. Emergency Lighting
10. Source Quality Control

B. System Description and Operation:

1. The Lighting Control and Automation system as defined under this section covers the following equipment:
  - a. Digital Room Controllers: Self-configuring, digitally addressable one, two, or three relays controllers with 0-10 volt control for LED drivers (if applicable) and single relay application-specific plug load controllers.
  - b. Digital Occupancy Sensors: Self-configuring, digitally addressable and calibrated occupancy sensors with LCD display and two-way active infrared (IR) communications.
  - c. Digital Switches: Self-configuring, digitally addressable pushbutton switches, dimmers, and scene switches with two-way active infrared (IR) communications.
  - d. Configuration Tools: Handheld remote for room configuration provides two way infrared (IR) communications to digital devices and allows complete configuration and reconfiguration of the device/room from up to 30 feet away. Unit to have Organic LED display, simple pushbutton interface, and allow send and receive of room variables and store of occupancy sensor settings. Computer software also customizes room settings.



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- e. Room Network - Digital Lighting Management (DLM) Local Network: Free topology, plug-in wiring system (Cat 5e) for power and data to room devices.
- f. Network Bridge: Provides BACnet MS/TP-compliant digital networked communication between rooms, panels, and the Segment Management or building automation system (BAS).
- g. Segment Manager: Provides web browser-based user interface for system control, scheduling, power monitoring, room device parameter administration and reporting.
- h. Emergency Lighting Control Unit (ELCU): Allows a standard lighting control device to control emergency lighting in conjunction with normal lighting in any area within a building.

### C. Lighting Control Applications:

- 1. Unless relevant provisions of the applicable local Energy Codes are more stringent, provide a minimum application of lighting controls as follows:
  - a. Space Control Requirements: Provide occupancy/vacancy sensors with Manual-ON functionality in all spaces except toilet rooms, storerooms, library stacks, or other applications where hands-free operation is desirable and Automatic-ON occupancy sensors are more appropriate. Provide Manual-ON occupancy/vacancy sensors for any enclosed office, conference room, meeting room, open plan system and training room. For spaces with multiple occupants, or where line-of-sight may be obscured, provide ceiling-or corner-mounted sensors and Manual-ON switches.
  - b. Daytime setpoints for total ambient illumination (combined daylight and electric light) level that initiate dimming will be programmed to be not less than 125 percent of the maintained designed illumination levels without outside influence.
  - c. Multiple-leveled switched daylight harvesting controls may be utilized for areas marked on Drawings.
  - d. Provide smooth and continuous daylight dimming for areas marked on Drawings. Daylighting control system may be designed to turn off electric lighting when daylight is at or above required lighting levels, only if system functions to turn lamps back on at dimmed level, rather than turning full-on prior to dimming.

## 1.2 RELATED SECTIONS

- A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.



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**1.3 REFERENCES AND STANDARDS**

- A. References and Standards per Division 01, General Requirements and Section 26 00 00, Electrical Basic Requirements.

**1.4 SUBMITTALS**

- A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.
- B. In addition, provide:
  - 1. Layout of sensors indicating their sensing distribution on reproducible Architectural Floor Plans.
  - 2. Shop Drawings: Provide wiring diagrams indicating low voltage and line voltage wiring requirements for occupancy sensors, and each digital lighting control system shown on the electrical drawings.
  - 3. Closeout Submittals:
    - a. Sustainable Design Closeout Documentation: Lighting Control System Manufacturer to provide Enhanced Start-up documentation that details the start-up procedure being performed including a process to follow, details on tests performed and an area that documents any test results.

**1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.
- B. In addition, meet the following:
  - 1. Manufacturer: Minimum 10 years experience in manufacture of architectural lighting controls.
  - 2. Manufacturer's Quality System: Registered to ISO 9001:2000 Quality Standard, including in-house engineering for product design activities.
  - 3. Lighting Control System Components: Listed by UL specifically for the required loads. Provide evidence of compliance upon request.
  - 4. Use manufacturer's published testing and adjusting procedures to adjust sensors time delay, and passive infrared sensitivity to satisfaction of Owner.
  - 5. Training: Provide minimum 4-hour training session to Owner's Authorized Representatives at a time approved by Owner after Owner has received approved operation and maintenance manuals. Training to include discussion of operation, adjustment, and replacement of sensors, photocells and control.
  - 6. Prepare and complete report of test procedures and results. Submit these test procedures and results to Owner.

**1.6 WARRANTY**

- A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Wattstopper DLM Series
- B. Lutron Athena Series
- C. Acuity nLight
- D. Eaton Wavelinx
- E. Leviton Lighting Controls
- F. Hubbell Control Solutions
- G. Or approved equivalent.
- H. Basis of Design: Daylighting and occupancy sensor layout on Drawings are designed based on Wattstopper product line. Approved manufacturers listed below are allowed on condition of meeting specified conditions including complete sensor coverage of area controlled and switching of luminaires in area controlled. Provide additional sensors and room controllers as needed to provide same level of functionality as shown on Drawings. Remove and replace electrical equipment installed not meeting these conditions at no cost to Owner.

**2.2 GENERAL PERFORMANCE**

- A. Daylight Harvesting and Occupant Detection to Control Lighting with the Following Hierarchy:
  - 1. Emergency (Highest Priority): Ignores all other inputs.
  - 2. Programming: During system programming, sensor inputs are ignored.
  - 3. Occupant Sensor: Allows lights to be on/off.
  - 4. Personal Control: Fine tune light levels up to the daylight sensor limit.
- B. Response to a single sensor can be unique on luminaire by luminaire basis.
- C. Power failure recovery - All devices return to their previous light level prior to power loss.
- D. All programmable devices with integral power failure memory to maintain settings for a minimum of 10 hours during power loss.
- E. Wall station and sensor replacement accomplished without programming.





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**2.3 DIGITAL WALL OR CEILING MOUNTED OCCUPANCY SENSOR SYSTEM**

- A. Wall or Ceiling mounted (to suit installation) dual technology digital (passive infrared and ultrasonic) occupancy sensor. Furnish the system accommodating the square-foot coverage requirements for each area controlled, utilizing room controllers, digital occupancy sensors, and accessories which suit the lighting and electrical system parameters.
- B. Digital Occupancy Sensors will provide graphic LCD display for digital calibration and electronic documentation. Features include the following:
  - 1. Digital calibration and pushbutton programming for the following variables:
    - a. Sensitivity: 0-100 percent in 10 percent increments.
    - b. Time delay: 1-30 minutes in 1 minute increments.
    - c. Test mode: Five second time delay.
    - d. Detection technology: PIR, Ultrasonic or Dual Technology activation and/or re-activation.
    - e. Walk-through mode.
    - f. Load parameters including Auto/Manual-ON, blink warning, and daylight enable/disable when photosensors are included in the DLM local network.
  - 2. Two RJ-45 port(s) for connection to DLM local network.
  - 3. Two-way infrared (IR) transceiver to allow remote programming through handheld commissioning tool and control by remote personal controls.
  - 4. Device Status LEDs including:
    - a. PIR Detection.
    - b. Ultrasonic detection.
    - c. Configuration mode.
    - d. Load binding.
  - 5. Assignment of occupancy sensor to a specific load within the room without wiring or special tools.
  - 6. Manual override of controlled loads.
- C. Units will not have any dip switches or potentiometers for field settings.
- D. Multiple occupancy sensors may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration will be required.

## 2.4 DIGITAL WALL SWITCHES

- A. Low voltage momentary pushbutton switches in 1, 2, 3, and 4 button configuration; available in white, light almond, ivory, grey, and black; compatible with wall plates with decorator opening. Wall switches will include the following:
  - 1. Two-way infrared (IR) transceiver for use with personal and configuration remote controls.
  - 2. Removable buttons for field replacement with engraved buttons and/or alternate color buttons. Button replacement may be completed without removing the switch from the wall.
  - 3. Red configuration LED on each switch that blinks to indicate data transmission.
  - 4. Blue Load/Scene Status LED on each switch button with the following characteristics:
    - a. Bi-level LED.
    - b. Dim locator level indicates power to switch.
    - c. Bright status level indicates that load or scene is active.
  - 5. Dimming switches will include seven bi-level LEDs to indicate load levels using 14 steps.
- B. Two RJ-45 ports for connection to DLM local network.
- C. Multiple digital wall switches may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration will be required to achieve multi-way switching.
- D. The following switch attributes may be changed or selected using a wireless configuration tool:
  - 1. Load and Scene button function may be reconfigured for individual buttons (from Load to Scene, and vice versa).
  - 2. Individual button function may be configured to Toggle, On only, or Off only.
  - 3. Individual scenes may be locked to prevent unauthorized change.
  - 4. Fade Up and Fade Down times for individual scenes may be adjusted from 0 seconds to 18 hours.
  - 5. Ramp rate may be adjusted for each dimmer switch.
  - 6. Switch buttons may be bound to any load on a room controller and are not load type dependent; each button may be bound to multiple loads.

## **2.5 ROOM CONTROLLERS**

- A. Room controllers automatically bind the room loads to the connected devices in the space without commissioning or the use of any tools. Room controllers shall be provided to match the room lighting load and control requirements. The controllers will be simple to install and will not have, dip switches, potentiometers or require special configuration. The control units will include the following features:
1. Automatic room configuration to the most energy-efficient sequence of operation based upon the devices in the room.
  2. Simple replacement - Using the default automatic configuration capabilities, a room controller may be replaced with an off-the-shelf unit without requiring any configuration or setup.
  3. Device Status LEDs to indicate:
    - a. Data transmission.
    - b. Device has power.
    - c. Status for each load.
    - d. Configuration status.
  4. Quick installation features including:
    - a. Standard junction box mounting.
    - b. Quick low voltage connections using standard RJ-45 patch cable.
  5. Plenum rated.
  6. Manual override and LED indication for each load.
  7. Dual voltage (120/277 VAC, 60 Hz).
  8. Zero cross circuitry for each load.
- B. On/Off/Dimming Enhanced Room Controllers are to include:
1. Real time current monitoring.
  2. Three relay configuration.
  3. Efficient 250 mA switching power supply.
  4. Four RJ-45 DLM local network ports.
  5. One 0-10 volt analog output per relay for control of compatible LED drivers.
  6. Network Bridge for BACnet MS/TP communications (LMRC-3xx).

7. The following dimming attributes may be changed or selected using a wireless configuration tool:
  - a. Establish preset level for each load from 0-100 percent.
  - b. Set high and low trim for each load.
8. Discrete model listed for connection to receptacles, for occupancy-based control of plug loads within the space.
  - a. One relay configuration only.
  - b. Automatic ON/OFF configuration.

## **2.6 ROOM NETWORK (DLM LOCAL NETWORK)**

- A. The DLM local network is a free topology lighting control physical connection and communication protocol designed to control a small area of a building. Digital room devices connect to the network using CAT 5e cables with RJ-45 connectors which provide both data and power to room devices. Features of the DLM local network include:
  1. Plug n' Go automatic configuration and binding of occupancy sensors, switches and lighting loads to the most energy-efficient sequence of operation based upon the device attached.
  2. Simple replacement of any device in the network with a standard off the shelf unit without requiring commissioning, configuration or setup.
  3. Push n' Learn configuration to change the automatic configuration, including binding and load parameters without tools, using only the buttons on the digital devices in the local network.

## **2.7 CONFIGURATION TOOLS**

- A. A configuration tool facilitates optional customization of DLM local networks, and is used to set up open loop daylighting sensors. A wireless configuration tool features infrared communications, while PC software connects to each local network via a USB interface.
- B. Features and functionality of the wireless configuration tool to include:
  1. Two-way infrared (IR) communication with DLM IR-enabled devices within a range of approximately 30 feet.
  2. High visibility organic LED (OLED) display, pushbutton user interface and menu-driven operation.
  3. Read, modify and send parameters for occupancy sensors, daylighting sensors, room controllers, and buttons on digital wall switches.
  4. Save up to nine occupancy sensor setting profiles, and apply profiles to selected sensors.

5. Temporarily adjust light level of any load(s) on the local network, and incorporate those levels in scene setting.
6. Adjust or fine-tune daylighting settings established during auto-commissioning, and input light level data to complete commissioning of open loop daylighting controls.

## **2.8 NETWORK BRIDGE**

- A. The network bridge connects a DLM local network to a BACnet-compliant network for communication between rooms, panels and a segment manager or BAS. Each local network is to include a network bridge component to provide a connection to the local network room devices. The network bridge is to use industry standard BACnet MS/TP network communication.
  1. The network bridge may be incorporated directly into the room controller hardware (LMRC-3xx Room Controllers) or be provided as a separate module connected on the local network through an available RJ-45 port.
  2. Provide Plug n' Go operation to automatically discover all room devices connected to the local network and make all device parameters visible to the segment manager via the segment network. No commissioning is to be required for set up of the network bridge on the local network.
  3. The network bridge is to automatically create standard BACnet objects for selected room device parameters to allow any BACnet-compliant BAS to include lighting control and power monitoring features as provided by the DLM room devices on each local network. Standard BACnet objects are to be provided as follows:
    - a. Read/write the normal or after hours schedule state for the room.
    - b. Read the detection state of the occupancy sensor.
    - c. Read/write the On/Off state of loads.
    - d. Read/write the dimmed light level of loads.
    - e. Read the button states of switches.
    - f. Read total current in amps, and total power in watts through the room controller.
    - g. Read/write occupancy sensor time delay, PIR sensitivity and ultrasonic sensitivity settings.
    - h. Activate a preset scene for the room.
    - i. Read/write daylight sensor fade time and day and night setpoints.
    - j. Read the current light level, in footcandles, from interior and exterior photosensors and photocells.

- k. Set daylight sensor operating mode.
- l. Read/write wall switch lock status.

## **2.9 SEGMENT MANAGER**

- A. The Digital Lighting Management system is to include at least one segment manager to manage network communication. It is to be capable of serving up a graphical user interface via a standard web browser. Each segment manager is to have support for one segment networks as required and allow for control of a maximum of 120 local networks (rooms) and/or lighting control panels per segment network.
- B. Operational features of the segment manager to include the following:
  - 1. Connection to PC or LAN via standard Ethernet TCP/IP.
  - 2. Easy to learn and use graphical user interface, compatible with Internet Explorer 11 or equal browser.
  - 3. Log in security capable of restricting some users to view-only or other limited operations.
  - 4. Automatic discovery of all DLM devices on the segment network(s). Commissioning beyond activation of the discovery function is not to be required.
  - 5. After discovery, all rooms and panels to be presented in a standard navigation tree format. Selecting a device from the tree will allow the device settings and operational parameters to be viewed and changed by the user.
  - 6. Ability to view and modify room device operational parameters. It is to be possible to set device parameters independently for normal hours and after hours operation.
  - 7. Ability to set up schedules for rooms and panels. Schedules to automatically set controlled zones or areas to either a normal hours or after hours mode of operation.
  - 8. Ability to group rooms and loads for common control by schedules, switches or network commands.
  - 9. Ability to monitor connected load current and display power consumption for areas equipped with room controllers incorporating the integral current monitoring feature.
  - 10. Provide seamless integration with the BAS via BACnet IP.

## **2.10 EMERGENCY LIGHTING**

- A. Emergency Lighting Control Unit - A UL 924 listed device that monitors a switched circuit providing normal lighting to an area. The unit provides normal ON/OFF control of emergency lighting along with the normal lighting. Upon normal power failure the

emergency lighting circuit will close, forcing the emergency lighting ON until normal power is restored. Features include:

1. 120/277 volts, 50/60 Hz, 20 amp driver rating.
2. Push to test button.
3. Auxiliary contact for remote test or fire alarm system interface.
4. UL2043 plenum rated.

## **2.11 SOURCE QUALITY CONTROL**

- A. Perform full-function testing on all completed assemblies at end of line.
- B. Diagnostics and Service - Tiered control scheme for dealing with component failure that minimizes loss of control for occupant.
  1. Bus Failure: Lights go to emergency level for safety.
  2. Failure of One Sensor Type: Driver still controllable via other sensors.
  3. Driver Failure: Only impacts one fixture - remainder of system operates as programmed.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Install equipment in accordance with manufacturer's installation instructions and Contract Documents.
- B. Provide equipment at locations and in quantities indicated on Drawings. Provide any additional equipment required to provide control intent.
- C. Verify with manufacturer's representative that sensors and photocells are laid out in compliance to manufacturer's published sensing distribution. Provide additional sensors for complete coverage of space being sensed.
- D. Do not install equipment until following conditions can be maintained in spaces to receive equipment:
  1. Ambient temperature: 32 degrees F to 104 degrees F.
  2. Relative Humidity: Maximum 90 percent, non-condensing.
- E. Lighting control system must be protected from dust during installation.
- F. Prior to applying continuous dimming daylighting controls, maintain LED lighting at full output for a minimum of 100 hours. If this is not done, replace lamps and drivers of affected luminaires at no cost to Owner.

- G. Use manufacturer's published testing and adjusting procedures to adjust sensor time delay, daylight sensitivity, and passive infrared sensitivity to satisfaction of Owner.
- H. Systems Integration:
  - 1. Equipment Integration Meeting Visit: Owner's Authorized Representative to coordinate meeting with Lighting Control System Manufacturer and other related equipment manufacturers to discuss equipment and integration procedures.

### **3.2 STARTUP AND PROGRAMMING**

- A. Provide factory-certified field service engineer to ensure proper system installation and operation under following parameters:
  - 1. Qualifications for Factory-Certified Field Service Engineer:
    - a. Minimum experience of two years training in the electrical/electronic field.
    - b. Certified by the equipment manufacturer on the system installed.
  - 2. Site Visit Activities:
    - a. Verify connection of power feeds and load circuits.
    - b. Verify connection of controls.
    - c. Verify system operation control by control, circuit by circuit.
    - d. Obtain sign-off on system functions.
    - e. Demonstrate and educate Owner's Authorized Representative on system capabilities, operation and maintenance.
- B. Tech Support: Provide factory direct technical support hotline 24 hours per day, seven days per week.

### **3.3 FIELD QUALITY CONTROL**

- A. Manufacturer Services:
  - 1. Aim and Focus Visit: Facility Representative to coordinate on-site meeting with Lighting Control System Manufacturer and Lighting Design Consultant to make required lighting adjustments to the system for conformance with the Lighting Design Consultant's original design intent.

### **3.4 CLOSEOUT ACTIVITIES**

- A. Training Visit: Lighting Control System Manufacturer to provide one day additional on-site system training to site personnel no less than two months after Substantial Completion, separate from start-up and programming visit.





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- B. On-Site Walk Through: Lighting Control System Manufacturer to provide a factory certified Field Service Engineer to demonstrate system functionality to the Commissioning Agent.
- C. Test lighting controls to ensure that control devices, components, equipment and systems are calibrated, adjusted and operate in accordance with Drawings and Specifications. Provide functional testing of sequences of operation to ensure operation in accordance with Drawings and Specifications. Provide complete report of test procedures and results to engineer and insert approved copy into project closeout documents.
- D. Testing Includes:
  - 1. Occupant sensing automatic controls.
  - 2. Automatic time and override controls for interior lighting.
  - 3. Automatic time and photo controls for exterior lighting.

**END OF SECTION**

**SECTION 26 24 13  
SWITCHBOARDS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Work Included:
  - 1. Switchboards
  - 2. Non-Utility Power Meters (Microprocessor-Based Metering Equipment)

**1.2 RELATED SECTIONS**

- A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.
- B. In addition, reference the following:
  - 1. Section 26 05 73, Electrical Distribution System Studies.
  - 2. Section 26 28 00, Overcurrent Protective Devices.

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.
- B. In addition, meet the following:
  - 1. UL 891, Standards for Switchboards.

**1.4 SUBMITTALS**

- A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.
- B. In addition, provide:
  - 1. Product Data: For each type of switchboard, overcurrent protective device, surge suppression device, ground-fault protector, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
  - 2. Shop Drawings: For each switchboard and related equipment.
    - a. Dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings. Include the following:
      - 1) Enclosure types and details for types other than NEMA 250, Type 1.

- 2) Bus configuration, current, and voltage ratings.
  - 3) Short-circuit current rating of switchboard and overcurrent protective devices.
  - 4) Descriptive documentation of barriers specified for electrical insulation and isolation.
  - 5) Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
- b. Wiring Diagrams: Power, signal, and control wiring.
3. Operation and Maintenance Manuals:
  - a. After completion of work and start-up of the equipment at the project site, deliver to the Owner's Authorized Representative operation instructions, maintenance manuals and drawings presenting full details for care and maintenance of each type of equipment provided under this Contract. Number of copies in accordance with Division 01.
  - b. Each copy to contain the operating and maintenance information and parts lists for equipment provided under this Contract. When necessary, provide supplemental drawings to show system operation and servicing maintenance points. For electrical components, provide wiring and connection diagrams. Include instructions required to accomplish specified operation and functions. Data to be neat, clean, and legible.
  - c. Switchboard drawings and wiring diagrams to be included and up to date at the completion of start-up and system acceptance by the Owner. Drawings and wiring diagrams to include any field modifications or changes to reflect actual as-installed conditions.
  - d. In general, the manual to include, but not necessarily be limited to, the following:
    - 1) Switchboard Elevation and One Line.
    - 2) AC and DC Schematic and Physical Component Layout Drawings.
    - 3) Remote Interface Drawing.
    - 4) Bill of Material.
    - 5) Description of Operation.
  - e. Provide manuals in accordance with Division 01 adequately labeled with the project name and location and the contents indexed.

- C. Manufacturer Seismic Qualification Certification: Submit certification that switchboards, accessories, and components will withstand seismic forces defined in Section 26 00 00, Electrical Basic Requirements.
1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
    - 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 and the unit will be fully operational after the seismic event."
  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 on their installation requirements.
  4. Submit emergency system performance test results per NFPA 110-7.13.

#### **1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

#### **1.6 WARRANTY**

- A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

### **PART 2 - PRODUCTS**

#### **2.1 MANUFACTURERS**

- A. Switchboards
1. Eaton
  2. ABB/General Electric
  3. Basis of Design: Schneider Electric/Square D
  4. Or approved equivalent.
- B. Non-Utility Power Meters (Microprocessor-Based Metering Equipment)
1. Eaton
  2. ABB/General Electric
  3. Basis of Design: Schneider Electric/Square D

4. Or approved equivalent.
- C. Manufacturers listed above are allowed on condition of meeting specified conditions including available space for equipment, Code required working clearances, selective coordination per Section 26 05 73, Electrical Distribution System Studies, and amps interrupting capacity (AIC) per short circuit study in Section 26 05 73, Electrical Distribution System Studies. Prior to submitting bid, manufacturer to provide documentation to Engineer verifying specific conditions, including those mentioned above, can be met. Remove and replace electrical equipment installed, at no cost to the Owner, that does not meet these conditions.

## **2.2 SWITCHBOARDS**

- A. Description: NEMA PB 2 freestanding switchboard with electrical ratings and configurations as indicated and specified.
- B. Integrated Equipment Rating: Provide fully rated integrated equipment rating greater than the available fault current. Series rated switchboards are not acceptable. Reference drawings for available fault current. If drawings do not have available fault current shown, then coordinate with serving electrical utility. Final rating based on the protective device study completed under the provisions of Division 26, Electrical Distribution System Studies.
- C. Enclosure to be suitable for having 100 percent rated circuit breakers installed and applied at 100 percent. Enclosure to meet minimum size and ventilation requirements set forth on the 100 percent circuit breaker or must be UL tested for 100 percent rating of the circuit breaker.
- D. Bus Material: Copper, standard size.
- E. Ground Bus: Extend length of switchboard, 50 percent of phase bus capacity.
- F. Neutral Bus: 100 percent rated, full length of switchboard.
- G. Lugs: Mechanical type for copper conductors.
- H. Molded Case Circuit Breakers: Integral thermal and instantaneous magnetic trip in each pole. Bolt-on type/secured connection with frame, with common trip handle for poles. UL listed. Pre-drill bus for bolt-on breakers.
  1. Provide circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits.
  2. Include shunt trip where indicated.
- I. Metering Transformer Compartment: For utility company's use; compartment size, bus spacing and drilling, door, and locking and sealing requirements in accordance with utility company's requirements.
- J. Utility Pull Section:
  1. Width as shown on Drawings. Depth and height to match switchboard.

2. Arrange as shown on Drawings.
- K. Future Provisions: Fully equip spaces for future devices with bussing and bus connections, suitably insulated and braced for short circuit currents. Provide continuous current rating as indicated.
- L. Enclosure: NEMA Type 1 - Indoor.
  1. Align sections as shown on Drawings.
  2. Finish: Manufacturer's standard light gray enamel over external surfaces. Coat internal surfaces with minimum one coat corrosion-resisting paint, or plate with cadmium or zinc.
  3. Removable front covers: Screw attached.
  4. Provide removable hinge pins on hinged doors.
  5. Provide full height barriers between sections.

### **2.3 NON-UTILITY POWER METERS (MICROPROCESSOR-BASED METERING EQUIPMENT)**

- A. Power Xpert Branch Circuit Monitor
  1. The main breaker meter to be Eaton PowerXpert 4000 or approved equal.
  2. Sub breaker meters to be Eaton Power IQ 250 or approved equal.
  3. Power meters to have certified revenue accuracy as per ANSI C12.20 and IEC 60687 class 0.5S or better.
  4. The meter and associated instrument transformers to provide accuracy of +/- 1 percent over the range of 5 percent to 100 percent of rated current or voltage, +/- 2 percent over the range of 5 percent to 100 percent of rated power.
  5. Where shown on Drawings, supply a UL listed microprocessor-based Branch Circuit Monitoring System (PXBCM), or approved equal having the specified features. This system is to consist of meter base, and meter module(s) as described below.
  6. The Branch Circuit Monitor is to measure the following operational data for up to 84 branch load circuits:
    - a. Forward and Reverse kWh.
    - b. Watts, VA, Amps, Power Factor.
    - c. Present and Peak demand readings for Amps, Forward and Reverse Watts.
    - d. Maximum Watts, VA, Amps.



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7. The Branch Circuit Monitor is to support alarms for current that can be set based on percent of breaker rating and alarms for voltage based on percent of nominal voltage.
  - a. High, High-High, Low, Low-Low non-latching alarms for current.
  - b. High and Low latching alarms for current, resettable via Modbus or the WEB interface.
  - c. High and Low latching and non-latching voltage alarms for each meter module input voltage.
  - d. Alarm Status and alarm counters shall be available via Modbus communications.
8. Branch Circuit monitor is to support upgradeable firmware via communications.
9. The Branch Circuit Monitor is to have the following ratings:
  - a. Elevation: 0 to 9843 ft (0 to 3000M).
  - b. Pollution degree: 2 (IEC 60644-1).
  - c. Ambient temperature range: -20 degrees C to +70 degrees C (-4 degrees to +158 degrees F).
  - d. Storage temperature range: -40 degrees C to +85 degrees C (-40 degrees F to +185 degrees F).
  - e. Humidity: 5 percent to 95 percent non-condensing.
  - f. PXBCM as a component to have a NEMA 1 rating. When installed in an enclosure it will have the same rating as its enclosure NEMA 1.
  - g. Housing Ingress Protection: IP20 as a component, in an enclosure the same as the enclosure.
  - h. CE Mark.
  - i. EMC (Electromagnetic Compatibility):
    - 1) IEC61326: EMI IEC61000-4-X Level 3.
    - 2) CISPR 11: Class B emissions, CISPR 22 (Ethernet) class B emissions.
    - 3) FCC Part 15 Class B emissions.
  - j. UL/cUL 61010-1 3rd Edition.
  - k. EN61010-1.

10. PXBCM Meter Base:
- a. Each PXBCM-MB Meter Base to support connection of up to 4 Meter Modules in either a MMS Strip or MME External configuration monitoring a total of up to 100 single-phase two-wire AC loads, 48 single-phase three-wire AC loads or 32 three-phase four-wire AC loads or combinations not to exceed 25 poles per meter module.
  - b. The PXBCM-MB to be equipped with 4 meter module ports. Each port will provide control power and communications to either a PXBCM-MMS Meter Module Strip or a PXBCM-MME Meter Module External with a maximum cable length of 28 feet between each Meter Base and each Meter Module.
  - c. Each PXBCM-MB is to support connection to up to 4 PXBCM-MMS Meter Module Strip or 4 PXBCM-MME Meter Module External, or a combination of up to 4 total PXBCM-MMS and PXBCM-MME each meter module with independent single or three phase voltage metering circuits with inputs up to 277V L-N and 480V L-L.
  - d. PXBCM-MB Power Supply to be rated for 100-277VAC L:N +/-10 percent CAT III, 47-63 Hz, 6W.
  - e. The PXBCM-MB to include a 3 terminal RS-485 serial port for Modbus RTU communications and an RJ-45 port for Ethernet communications. The Ethernet port will support Modbus TCP communications as well as an Embedded WEB server.
  - f. The PXBCM-MB embedded WEB server is to support device configuration for to up to 4 PXBCM-MMS Meter Module Strip or 4 PXBCM-MME Meter Module External, or a combination of up to 4 total PXBCM-MMS and PXBCM-MME and display of up to 100 points of metering data. It will be possible to save device configuration information to a file for archiving and for uploading to PXBCM.
  - g. The PXBCM-MB to support connection to a pre-configured HMI via RS-485 serial port. The HMI will not require configuration.
  - h. The PXBCM-MB is to be equipped with LEDs to indicate communications activity and Device/Alarm Status. An LED will also indicate if Ethernet is configured for DHCP (automatically assigned IP address) or Fixed IP (manually assigned IP address). The PXBCM-MB is to be equipped with 2 rotary switches to assign Modbus Slave ID 1-99.
  - i. The PXBCM-MB is to be equipped with security mode switches to enable the device to operate in a secure mode to prevent tampering with device configuration and resets over comms.
  - j. The PXBCM Meter Base is to automatically sense the type of PXBCM Meter Module connected to each of its 4 meter module ports.



- k. The Configuration Wizard is to support naming and configuration of up to 100 virtual meters by assigning 1-3 channels of current to 1, 2 or 3 pole meters. Virtual meters are to aggregate the channel data assigned to each virtual meter and report the aggregated virtual meter values for:
  - 1) Forward and Reverse Energy.
  - 2) Watts, VA, Average Amps and Power Factor.
  - 3) Average and Peak demand for Watts and VA.
- 11. PXBCM-MMS Meter Module Strip:
  - a. PXBCM-MMS Meter Module Strips to be available in configurations to mount on either the left or right of a panelboard and contain 9, 15, or 21 CTs. Four additional 333mV connections are to be provided on each PXBCM-MMS for Auxiliary 333mV CT connections which can be used to monitor the panel mains or branch circuits. The MMS is to include both load current and voltage metering circuits providing meter data to the Meter Base.
  - b. The PXBCM Meter Module Strip is to be available with either 9 CTs, 15 CTs or 21 CTs per assembly for factory assembly into Panelboards with 18, 30 or 42 poles. PXBCM MMS CTs are to be rated for up to 100A continuous current monitoring and designed to mount in an Eaton PRL-1a, PRS-2a or PRL-3e Panelboard with 1-inch breaker pole spacing.
  - c. PXBCM Meter Module Strip 1-inch center CTs are to have a window opening sufficient for insulated Aluminum conductor rated for 100A capacity.
  - d. The PXBCM Meter Module Strip is to support direct connection of one set of 3 phase nominal metering voltage inputs up to 277V L-N and 480V L-L voltages and be rated as Cat III.
  - e. The Meter Modules can also monitor voltage in the following configurations:
    - 1) Three phase, four wire wye.
    - 2) Three phase, three wire delta.
    - 3) Three phase, center tapped delta.
    - 4) Three phase, three wire.
    - 5) Single phase, two wire.
  - f. Power and Energy metering to be performed based on the voltage assignment for each 100A strip mounted CT and 333mV Aux CT current input as configured using the embedded WEB server.

- g. PXBCM MMS Accuracy of kWh metering on branch circuits to be rated for ANSI C12.20 0.5 accuracy class as a system, including 100A rated strip mounted solid core current transformers. kWh accuracy for 333mV input auxiliary circuits is to satisfy ANSI C12.20 0.5 class excluding external 333mV sensor performance.
  - h. The PXBCM MMS to be UL approved for mounting to the panelboard interior with no interference. Strip placement is to line up 1-inch center CTs with breaker poles and not impede the normal routing of branch circuit conductors in the panel enclosure.
  - i. The PXBCM MMS to connect to the PXBCM MB using factory supplied cables.
12. PXBCM-MME Meter Module External:
- a. The PXBCM-MME provides the same metering functionality as the PXBCM-MMS but is used for retrofit or non-uniform/high-mix load applications where the PXBCM-MMS strip mounted 100A CTs cannot be applied.
  - b. The PXBCM Meter Module external is to support 25 channels of current using external 333mV current sensors connected to terminal strips on the PXBCM-MME.
  - c. The PXBCM Meter Module External is to support direct connection of one set of 3 phase nominal metering voltage inputs up to 277V L-N and 480V L-L voltages and be rated as Cat III.
  - d. The Meter Modules can also monitor voltage in the following configurations:
    - 1) Three phase, four wire wye.
    - 2) Three phase, three wire delta.
    - 3) Three phase, center tapped delta.
    - 4) Three phase, three wire.
    - 5) Single phase, two wire.
  - e. Power and Energy metering to be performed based on the voltage assignment for each 333mV current sensor input as configured using the embedded WEB server.
  - f. PXBCM MMS Accuracy of kWh metering on 333mV input circuits to satisfy ANSI C12.20 0.5 class excluding external 333mV sensor performance.
13. Optional HMI Display is to display data for all configured sub-meters.

- a. HMI configuration is not to be required for each sub-meter. The HMI will discover the configuration information automatically.
- b. Displayed information to include:
  - 1) Sub-meter name, current, voltage, energy consumption, demand, and power factor for up to 100 load circuits.
  - 2) Aggregated Power and Energy readings for any 1, 2 or 3 pole meters.

### **PART 3 - EXECUTION**

#### **3.1 GENERAL INSTALLATION REQUIREMENTS**

- A. Provide concrete housekeeping pad. Extend 6-inches beyond switchboard width and depth dimensions. Minimum 3-inches above finished floor. Install plumb and level.
- B. Verify that field measurements are as indicated on Shop Drawings.
- C. Install in a neat and workmanlike manner and in location shown on Drawings, according to NEMA PB 2.1.
- D. Adjust all operating mechanisms for free mechanical movement.
- E. Tighten bolted bus connections in accordance with manufacturer's instructions.
- F. Reference Section 26 08 05, Electrical Acceptance Testing for testing requirements.

#### **3.2 SWITCHBOARDS INSTALLATION**

- A. Shop inspect and test switchboard according to NEMA PB 2.
- B. Make completed switchboard available for inspection at manufacturer's factory prior to packaging for shipment. Notify Owner at least 7 days before inspection is allowed.
- C. Install switchboard in accordance with manufacturer's installation instructions.
- D. Tighten accessible bus connections and mechanical fasteners after placing switchboard.
- E. Provide arc flash labels per Section 26 05 73, Electrical Distribution System Studies.
- F. Provide engraved nameplates per Section 26 05 53, Identification of Electrical Systems.
- G. Provide fuses in each switch.
- H. Perform field inspection and testing.
- I. Perform inspections and tests listed in NETA STD ATS, Section 7.1.

- J. Measure, using a Megger, insulation resistance of each bus section phase-to-phase and phase-to-ground for one minute each, at minimum test voltage of 1000 Vdc; minimum acceptable value for insulation resistance is 1 megohm.
- K. Check tightness of accessible bolted bus joints using calibrated torque wrench per manufacturer's recommended torque values.
- L. Test ground fault systems by operating push-to-test button.
- M. Shunt Trip Circuit Breakers: Provide wiring to remote trip switch/contacts as indicated on Drawings.
- N. Adjust circuit breaker trip and time delay settings to values indicated.
- O. Adjust circuit breaker trip and time delay settings to values as instructed by Engineer.
- P. Clean exterior and interior of switchboard in accordance with manufacturers installation instructions.
- Q. Vacuum construction dust, dirt, and debris out of switchboard interior.
- R. Where enclosure finish is damaged, touch up finish with matching paint in accordance with manufacturer's specifications and installation instructions.

**3.3 NON-UTILITY POWER METERS (MICROPROCESSOR-BASED METERING EQUIPMENT) INSTALLATION**

- A. Perform field inspection and testing.
- B. Perform inspections and tests listed in NETA STD ATS, Section 7.1.
- C. Measure, using a Megger, insulation resistance of each bus section phase-to-phase and phase-to-ground for one minute each, at minimum test voltage of 1000 Vdc; minimum acceptable value for insulation resistance is 1 megohms.
- D. Check tightness of accessible bolted bus joints using calibrated torque wrench per manufacturers recommended torque values.
- E. Provide cabling between current and voltage sensors and meter display enclosure.
- F. Provide device label for each meter per Section 26 05 53, Identification for Electrical Systems, listing load monitored (e.g., "Panel A", "Chiller # 3, etc). Use red label with white lettering where load is on generator backup.
- G. Provide common multiple meter unit cabinet with blank spaces where multiple meters are mounted as shown on one-line diagram and/or floor plans (e.g., 8 meter cabinet with 3 blank spaces where 5 meters are shown in common location).
- H. Provide cabling between meter display enclosure and auxiliary device for communication to energy management system.



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SWITCHBOARDS**

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- I. Provide ModBus cabling between meters, and from meter to energy management system.
- J. Provide a minimum of 4 hours of video recorded training for Owner on use of non-utility meters.

**END OF SECTION**

**SECTION 26 24 16  
PANELBOARDS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Work Included:
  - 1. Panelboards

**1.2 RELATED SECTIONS**

- A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.
- B. In addition, reference the following:
  - 1. Section 26 05 73, Electrical Distribution System Studies.
  - 2. Section 26 24 13, Switchboards.
  - 3. Section 26 28 00, Overcurrent Protective Devices.

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.
- B. In addition, meet the following:
  - 1. UL 67, Standards for Panelboards.

**1.4 SUBMITTALS**

- A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.
- B. In addition, provide:
  - 1. Product Data: For each type of panelboard, overcurrent protective device, surge protective device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
  - 2. Shop Drawings: For each panelboard and related equipment.
    - a. Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:
      - 1) Enclosure types and details for types other than NEMA 250, Type 1.

- 2) Bus configuration, current, and voltage ratings.
    - 3) Short-circuit current rating of panelboards and overcurrent protective devices.
    - 4) Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
  - b. Wiring Diagrams: Power, signal, and control wiring.
3. Operation and Maintenance Manuals:
  - a. After completion of work and start-up of the equipment at the project site, deliver to the Owner's Authorized Representative operation instructions, maintenance manuals and drawings presenting full details for care and maintenance of each type of equipment provided under this Contract. Number of copies in accordance with Division 01.
  - b. Each copy to contain the operating and maintenance information and parts lists for equipment provided under this Contract. When necessary, provide supplemental drawings to show system operation and servicing maintenance points. For electrical components, provide wiring and connection diagrams. Include instructions required to accomplish specified operation and functions. Data to be neat, clean and legible.
  - c. Panelboard drawings and wiring diagrams to be included and up to date at the completion of start-up and system acceptance by the Owner. Drawings and wiring diagrams to include any field modifications or changes to reflect actual as-installed conditions.
  - d. In general, the manual to include, but not necessarily be limited to, the following:
    - 1) Panelboard Elevation and One Line.
    - 2) AC and DC Schematic and Physical Component Layout Drawings.
    - 3) Remote Interface Drawing.
    - 4) Bill of Material.
    - 5) Description of Operation.
- C. Manufacturer Seismic Qualification Certification: Submit certification that panelboards, accessories, and components will withstand seismic forces defined in Section 26 00 00, Electrical Basic Requirements.
  1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

- 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 and the unit will be fully operational after the seismic event."
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 on their installation requirements.
4. Submit emergency system performance test results per NFPA 110-7.13.

### **1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

### **1.6 WARRANTY**

- A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Panelboards:
  1. Eaton
  2. ABB/General Electric
  3. Basis of Design: Schneider Electric/Square D
  4. Or approved equivalent.
- B. Manufacturers listed above are allowed on condition of meeting specified conditions including available space for equipment, Code required working clearances, selective coordination per Section 26 05 73, Electrical Distribution System Studies, and amps interrupting capacity (AIC) per short circuit study in Section 260573, Electrical Distribution System Studies. Prior to submitting bid, manufacturer to provide documentation to Engineer verifying specific conditions, including those mentioned above, can be met. Remove and replace electrical equipment installed, at no cost to the Owner, that does not meet these conditions.

### **2.2 PANELBOARDS**

- A. Description: Panelboards 400 amps or less. NEMA PB1, Type 1 or as indicated on drawings, circuit breaker type. Maximum enclosure depth: 6-inches for surface mounted, 5-3/4-inches for flush mounted.



- B. Maximum Width: 20-inches.
- C. Integrated Equipment Rating: Provide fully rated integrated equipment rating greater than the available fault current. Series rated panelboards are not acceptable. Reference drawings for available fault current. If drawings do not have available fault current shown, then coordinate with serving electrical utility. Final rating based on the protective device study completed under the provisions of Division 26, Electrical Distribution System Studies.
- D. Panelboard Bus Non-Reduced: Copper, ratings as indicated on drawings. Bus bar with suitable electroplating (tin) for corrosion control at connection. Provide copper ground bus in each panelboard.
- E. Lugs: Mechanical type for both aluminum and copper conductors. All device terminals/lugs shall be rated for a minimum of 75 degrees C to facilitate the use of 75 degrees C conductor ampacity rating.
- F. Provide double lugs and/or feed-through lugs for feed through feeders.
- G. Molded Case Circuit Breakers: Thermal magnetic trip circuit breakers, bolt-on type/secured connection with frame, with common trip handle for poles; UL listed. Pre-drill bus for bolt-on breakers.
  - 1. Type SWD for lighting circuits.
  - 2. Type HACR for air conditioning equipment circuits.
  - 3. Class A ground fault interrupter circuit breakers where scheduled.
  - 4. Class B ground fault equipment protection circuit breakers for heat trace and other circuits as required by Code. Provide shunt trip circuit breakers where scheduled; provide wiring to remote trip switch/contacts as indicated on Drawings.
  - 5. Do not use tandem circuit breakers.
- H. Accessories: Provide where indicated: shunt trip and Class A ground fault circuit interrupter (GFCI).
- I. Cabinet Front: Provide flush or surface mounting as shown on the schedules, drawings, or otherwise noted. Cabinet front with concealed hinged front cover construction, metal directory frame with heavy clear plastic protector, flush lift latch and lock, two keys per panel all keyed alike.
- J. Provide boxes with removable blank end walls and interior mounting studs. Provide interior support bracket for ease of interior installation.
- K. Furnish surface mounted cabinet boxes without knockouts.



**PART 3 - EXECUTION**

**3.1 GENERAL INSTALLATION REQUIREMENTS**

- A. Install panelboards in accordance with NEMA PB 1.1, NECA 1 and manufacturer's installation instructions.
- B. Install panelboards level and plumb. Install recessed panelboards flush with wall finishes.
- C. Height: 6-feet 6-inches to top of panelboard; install panelboards taller than 6-feet 6-inches with bottom no more than 4-inches above floor.
- D. Provide filler plates for unused spaces in panelboards.
- E. Provide typed circuit directory for each branch circuit panelboard. Include all "spaces" and "spares." Revise directory to reflect circuiting changes and as-installed conditions. Use final Owner designated room names and numbers, and not designations shown on drawings.
- F. Provide engraved plastic nameplates per Section 26 05 53, Identification for Electrical Systems.
- G. Provide arc flash labels per Section 26 05 73, Electrical Distribution System Studies.
- H. Provide permanent identification number in or on panelboard dead-front adjacent to each breaker pole position. Horizontal centerline of numbers to correspond with centerline of circuit breaker pole position.
- I. Ground and bond panelboard enclosure per CEC.
- J. Paint:
  - 1. Standard factory finish unless noted otherwise.
  - 2. Panelboards located in finished interior areas in view of building occupants; paint to match adjacent wall surface. Color and paint preparation as specified by Architect. Covers to be painted off wall, then installed over dried, painted wall surface.
- K. Provide handle guards on each circuit supplying obviously constant loads such as fire alarm, security, lighting controls, refrigerators and freezers, fire protection, etc.
- L. Provide interior wiring diagram, neutral wiring diagram, UL label, and short circuit rating on interior or in booklet format inserted in sleeve inside panel cover.
- M. Perform inspections and tests in accordance with manufacturer's requirements.
- N. Thoroughly clean exterior and interior of each panelboard in accordance with manufacturer's installation instructions.
- O. Vacuum construction dust, dirt, and debris out of each panelboard.



## **SECTION 26 24 16 PANELBOARDS**

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- P. Where enclosure finish is damaged, touch up finish with matching paint in accordance with manufacturer's specifications and installation instructions.

### **3.2 PANELBOARDS INSTALLATION**

- A. Provide handle tie to branch circuit breakers of multiwire branch circuits for simultaneous disconnection of circuits. Handle tie will be identified for use with circuit breakers provided. Reconfigure assigned circuits as necessary so that circuit breakers associated with multiwire branch circuits are physically adjacent, record changes in panelboard schedules and circuiting plans for record drawings.
- B. Shunt Trip Circuit Breakers: Provide wiring to remote trip switch/contacts as indicated on Drawings.
- C. Measure steady state load currents at each panelboard feeder; rearrange circuits in panelboard to balance phase loads to within 20 percent of each other. Maintain proper phasing for multi-wire branch circuits.

**END OF SECTION**

**SECTION 26 27 13  
ELECTRICAL METERING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Work Included:
  - 1. Utility Metering Equipment

**1.2 RELATED SECTIONS**

- A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.
- B. In addition, reference the following:
  - 1. Section 26 24 13, Switchboards

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

**1.4 SUBMITTALS**

- A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.
- B. In addition, provide:
  - 1. Product Data: List of components for power monitoring, including dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes. Attach copies of Submittals for effected products (such as switchboards and switchgear) that describe power monitoring features to coordinate Product Data related to power monitoring.
  - 2. Shop Drawings: Detail assemblies of standard components, custom assembled for specific application on this Project.
    - a. Outline Drawings: Indicate dimensions, weights, arrangement of components, and clearance and access requirements.
    - b. Block Diagram: Show interconnections between components specified in this Section and devices furnished with power distribution system components. Indicate data communication paths and identify networks, data buses, data gateways, concentrators, and other devices to be used. Describe characteristics of network and other data communication lines.



## SECTION 26 27 13 ELECTRICAL METERING

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- c. Wiring Diagrams: Detail specific wiring to suit Project. Coordinate nomenclature and presentation with a block diagram, and differentiate between manufacturer-installed and field-installed wiring.
- 3. Closeout Documentation: Documentation that details the start-up procedure being performed including a process to follow, details on tests performed, and an area that documents any test results.

### 1.5 QUALITY ASSURANCE

- A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.
- B. In addition, meet the following:
  - 1. Energy metering to be of a single-source manufacturer of the major components within the assembly. Manufacturer will have documented experience in the manufacture of energy metering for a minimum of three years.
  - 2. Installer will have documented experience in the installation of energy metering for a minimum of three years.

### 1.6 WARRANTY

- A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements Division 01, General Requirements.

### 1.7 COORDINATION

- A. Coordinate features of distribution equipment and power monitoring components to form an integrated interconnection of compatible components.
  - 1. Match components and interconnections for optimum performance of specified functions.
  - 2. Coordinate Work of this section with BAS to indicate and record designated alarms registered in power monitoring displays.
    - a. Coordinate power monitoring components so metered electrical load and demand values and associated summary and trend reports specified in this Section are made accessible to the BAS system.
    - b. Log and store data from power monitoring system to facilitate production of monthly reports associated with the facility.
    - c. Provide capacity to maintain logged data for a minimum of ten years. Provide auto archive capability and locally accessible storage.
- B. Coordinate Work of this section with that in sections specifying distribution components that are monitored by power monitoring equipment.



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- C. Coordinate a communication link with BAS to meet input requirements of BAS integrator and gateway equipment provided as part of BAS installation.

### **PART 2 - PRODUCTS**

#### **2.1 MANUFACTURERS**

##### **A. Manufacturers:**

- 1. Utility Metering Equipment
  - a. Meter Base:
    - 1) Circle AW
    - 2) Or approved equivalent.
  - b. Metering Equipment Enclosure:
    - 1) ABB/General Electric
    - 2) Schneider Electric/Square D
    - 3) Eaton Electrical
    - 4) Siemens
    - 5) Or approved equivalent.

#### **2.2 UTILITY METERING EQUIPMENT**

- A. Meter Base: Surface or Flush mounted meter socket enclosure. Provide meter base(s) for energy/demand and reactive energy/demand bases as required by serving electric utility.
- B. Terminal Cabinet: Provide terminal cabinet that meets serving utility company's requirements. Construct as an integral part of main distribution switchboard.
- C. Provide fault withstand rating greater than utility determined available fault current.
- D. C.T. Enclosure: Provide enclosure that meets serving utility company's requirements. Construct as an integral part of main distribution switchboard.

### **PART 3 - EXECUTION**

#### **3.1 UTILITY METERING INSTALLATION**

- A. Meter Bases: Locate to provide acceptable access for meter reading and maintenance. Locate to minimize risk of physical damage.
- B. Metering Equipment: Install current transformers supplied by serving electric utility.



**SECTION 26 27 13  
ELECTRICAL METERING**

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- C. Verify utility requirements prior to bidding and provide associated work required by local utility including but not limited to:
1. Service underground primary including conduit, pull cord, excavation and backfill.
  2. Underground pull vaults.
  3. Pole risers.
  4. Transformer pads, and vaults.
  5. Secondary service lateral raceways.
  6. Grounding of transformers.
  7. Service metering equipment.

**END OF SECTION**

**SECTION 26 27 26  
WIRING DEVICES**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Work Included: Provision of materials, installation and testing of:
  - 1. Wall Switches
  - 2. Receptacles
  - 3. Finish Plates
  - 4. Surface Covers

**1.2 RELATED SECTIONS**

- A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

**1.4 SUBMITTALS**

- A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.
- B. In addition, provide:
  - 1. Wall Switches
  - 2. Receptacles
  - 3. Wall Plates
  - 4. In-Use Cover

**1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

**1.6 WARRANTY**

- A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.





**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

**A. Wall Switches:**

1. Toggle Type:
  - a. Cooper
  - b. Hubbell
  - c. Leviton
  - d. Legrand
  - e. Or approved equivalent.

**B. Receptacles:**

1. Commercial Grade:
  - a. 20 Amp:
    - 1) Cooper
    - 2) Hubbell
    - 3) Bryant
    - 4) Leviton
    - 5) Legrand P&S
    - 6) Or approved equivalent.
2. Ground Fault Circuit Interrupter (GFCI), Tamper-Resistant Receptacle - 20 Amp:
  - a. Cooper
  - b. Hubbell
  - c. Legrand P&S
  - d. Or approved equivalent.
3. Specification Grade Tamper-Resistant Duplex - 20 Amp:
  - a. Cooper
  - b. Hubbell



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- c. Leviton
    - d. Legrand P&S
    - e. Or approved equivalent.
  - 4. Federal Specification Grade Plug Load Controlled Duplex Receptacle:
    - a. Half Controlled, 20 Amp:
      - 1) Legrand P&S
      - 2) Leviton
      - 3) Hubbell
      - 4) Or approved equivalent.
- C. Finish Plates:
  - 1. Bryant
  - 2. Cooper
  - 3. Hubbell
  - 4. Leviton
  - 5. Legrand P&S
  - 6. Or approved equivalent.
- D. Surface Covers:
  - 1. While-in-Use Weatherproof Outlet Cover:
    - a. Die Cast Cover:
      - 1) Intermatic
      - 2) Hubbell
      - 3) Leviton
      - 4) Cooper
      - 5) Or approved equivalent.
- E. Provide lighting switches and receptacles of common manufacturer and appearance.

**2.2 WALL SWITCHES**

- A. Characteristics: Toggle type, quiet acting, 20 amp, 120/277 volt, UL listed for motor loads up to 80 percent of rated amperage, extra heavy duty.
- B. Finish: White.

**2.3 RECEPTACLES**

- A. Duplex Receptacles Characteristics: Straight parallel blade, 125 volt, 2 pole, 3 wire grounding.
  - 1. Commercial Grade: Riveted. Back and side wired. Brass ground contact on steel strap. Nylon face and nylon base. 20 amp.
- B. Ground Fault Circuit Interrupter (GFCI) Receptacle: Feed through type, back-and-side wired, tamper-resistant, weather resistant self-testing, 20 amp, 125 VAC.
- C. Specification Grade Tamper-Resistant Receptacle: 20 amp, 125 VAC, complies with CEC requirements.
- D. Specification Grade Plug Load Duplex Receptacle: 20A, 125V, Decora style duplex receptacle, straight blade, hot terminal split with 1 plug controlled, self grounding. Back and side wired.
- E. Special Purpose Receptacles: Reference Drawings for NEMA Standard Specification.
- F. Finish:
  - 1. Same exposed finish as switches.

**2.4 FINISH PLATES**

- A. Finish Plates: Match building standard.

**2.5 SURFACE COVERS**

- A. Material: Galvanized steel, drawn, 1/2-inch raised industrial type with openings appropriate for devices installed on surface receptacles.
- B. Cast Box and Extension Adaptors: Aluminum with gasket, blanks single-gang or 2-gang.
- C. While-in-Use Weatherproof Cover: NEMA 3R when closed over energized plug. Vertical mount for duplex receptacle. Provide continuous use cover with cover capable of closing over energized cord cap with bottom aperture for cord exit.
  - 1. Die cast cover with closed cell neoprene foam gasket: Capable of being locked closed to prevent tampering or unauthorized use.

**PART 3 - EXECUTION**

**3.1 GENERAL INSTALLATION REQUIREMENTS**

- A. See Architectural elevations for location and mounting height of wiring devices. Review Architectural elevations prior to rough-in and contact Architect immediately if conflicts are found between Architectural and Electrical Drawings. Do not rough-in devices until conflicts are resolved.
- B. Install wiring devices and finish plates plumb with building lines, equipment cabinets and adjacent devices. Devices not plumb will be fixed at no additional cost to Owner.
- C. Orientation:
  - 1. Install wiring devices with long dimension oriented vertically at centerline height shown on drawings or as specified.
  - 2. Vertical Alignment: When more than one device is shown on Drawings in close proximity to each other, but at different elevations, align devices on a common vertical center line for best appearance. Verify with Architect.
  - 3. Horizontal Alignment: When more than one device is shown on drawings in close proximity to each other with same elevation, align devices on a common horizontal center line for best appearance. Verify with Architect.
- D. Provide labeling per Section 26 05 53, Identification for Electrical Systems.
- E. Test wiring devices to ensure electrical continuity of grounding connections, and after energizing circuitry, to demonstrate compliance with requirements. Test receptacles for line to neutral, line to ground and neutral to ground faults. Correct any defective wiring.

**3.2 WALL SWITCHES INSTALLATION**

- A. At time of substantial completion, replace those items which have been damaged.

**3.3 RECEPTACLES INSTALLATION**

- A. Upon installation, adhere to proper and cautious use of convenience receptacles. At time of substantial completion, replace those items which have been damaged, including those burned and scored by faulty receptacles or cord caps.
- B. In the following outlet locations, regardless of whether shown as GFCI on Drawings, either provide a GFCI duplex receptacle, or use a GFCI breaker where code would require a GFCI outlet to have a remote test switch:
  - 1. Bathrooms.
  - 2. Where receptacles are installed within 6-feet, 0-inches from edge of sinks.
  - 3. Kitchens above counters.
  - 4. On rooftops.



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- 5. Outdoors.
- 6. Where serving vending machines.
- 7. Where serving electric drinking fountains.
- C. GFCI Receptacles: One GFCI receptacle may not be used to provide GFCI protection to downstream duplex receptacles on the same branch circuit.
- D. Provide tamper resistant receptacles in all areas where children will be present and as required by Code.

### **3.4 FINISH PLATES INSTALLATION**

- A. Do not install items until finish painting is complete. Replace scratched and paint splattered finish plates and wiring devices.

### **3.5 SURFACE COVERS INSTALLATION**

- A. Do not install items until finish painting is complete. Replace scratched and paint splattered finish plates and wiring devices.

**END OF SECTION**

**SECTION 26 28 00  
OVERCURRENT PROTECTIVE DEVICES**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Work Included:
  - 1. Molded Case Circuit Breakers

**1.2 RELATED SECTIONS**

- A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

**1.4 SUBMITTALS**

- A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.
- B. In addition, provide:
  - 1. Product data and time/current trip curves for circuit breakers supplied to project.

**1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements apply to this Section.

**1.6 WARRANTY**

- A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Molded Case Circuit Breakers:
  - 1. Eaton Electrical
  - 2. ABB/General Electric
  - 3. Schneider Electric/Square D
  - 4. Or approved equivalent.



**SECTION 26 28 00  
OVERCURRENT PROTECTIVE  
DEVICES**

**DIVISION 26**

**2.2 MOLDED CASE CIRCUIT BREAKERS**

- A. 1-, 2- or 3-pole bolt-on, single handle common trip, 600VAC or 250VAC as indicated on Drawings.
- B. Overcenter toggle-type mechanism, quick-make, quick-break action. Trip indication is by handle position.
- C. Calibrate for operation in 40 degrees C ambient temperature.
- D. 15 to 150 Amp Breakers: Permanent trip unit containing individual thermal and magnetic trip elements in each pole.
- E. 151 to 400 Amp Breakers: Adjustable magnetic trip elements. Provide push-to-trip button on cover of breaker for mechanical tripping.
- F. Greater than 401 Amp: Electronic trip type with adjustments for long-time, instantaneous, and short-time functions.

**PART 3 - EXECUTION**

**3.1 GENERAL INSTALLATION REQUIREMENTS**

- A. Coordination:
  - 1. Obtain and review the submitted product data for equipment furnished by the Owner, and furnished under other Divisions of this contract, particularly under Divisions 22 and 23.
  - 2. Confirm the equipment nameplate maximum overcurrent protection (MOCP) and make accommodations and adjustments to overcurrent protective devices as necessary to coordinate with the nameplate rating.
- B. Install all items in accordance with manufacturer's written instructions.

**3.2 MOLDED CASE CIRCUIT BREAKERS INSTALLATION**

- A. Provide testing of ground fault interrupting breakers.
- B. Provide circuit breakers, as specified and on Drawings, for installation in panelboards, individual enclosures or combination motor starters.
- C. Provide ground fault interrupter circuit breakers for equipment in damp or wet locations.
- D. Provide device on handle to lock breaker in "ON" position for breakers feeding time switches, night lights and similar circuits required to be continuously energized.
- E. Shunt Trip Circuit Breakers: Provide wiring to remote trip switch/contacts as indicated on Drawings.
- F. Provide multi-pole branch circuit breakers for multiwire branch circuits for simultaneous disconnection of circuits.



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OVERCURRENT PROTECTIVE  
DEVICES**

**DIVISION 26**

**END OF SECTION**



**SECTION 26 28 16  
ENCLOSED SWITCHES AND CIRCUIT BREAKERS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Work Included:
  - 1. Toggle Type Disconnect Switches
  - 2. Safety Switches

**1.2 RELATED SECTIONS**

- A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.
- B. In addition, reference the following:
  - 1. Section 26 05 73, Electrical Distribution System Studies
  - 2. Section 26 24 13, Switchboards
  - 3. Section 26 24 16, Panelboards
  - 4. Section 26 28 00, Overcurrent Protective Devices

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

**1.4 SUBMITTALS**

- A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

**1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

**1.6 WARRANTY**

- A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Toggle Type Disconnect Switches:



## **SECTION 26 28 16 ENCLOSED SWITCHES AND CIRCUIT BREAKERS**

### **DIVISION 26**

1. Cooper
  2. Hubbell
  3. Leviton
  4. Legrand (Pass & Seymour)
  5. Slater
  6. Or approved equivalent.
- B. Safety Switches:
1. Eaton Electrical
  2. ABB/General Electric
  3. Schneider Electric/Square D
  4. Or approved equivalent.

#### **2.2 TOGGLE TYPE DISCONNECT SWITCHES**

- A. Rating: 120 or 277 volt, 1 or 2 pole, 20 amp, 1 hp maximum.
- B. Enclosure:
  1. NEMA 1: Dry locations/Indoors.
  2. NEMA 3R: Damp or wet locations/Outdoors.
- C. Handle lockable in "OFF" position.

#### **2.3 SAFETY SWITCHES**

- A. Clearly marked for maximum voltage, current, and horsepower.
- B. Operable handle interlocked to prevent opening front cover with switch in 'on' position.
- C. Switches rated for maximum available fault current.
- D. Handle lockable in "OFF" position.
- E. Enclosure:
  1. NEMA 1: Dry locations/Indoors.
  2. NEMA 3R: Damp or wet locations/Outdoors.



## **SECTION 26 28 16 ENCLOSED SWITCHES AND CIRCUIT BREAKERS**

**DIVISION 26**

### **PART 3 - EXECUTION**

#### **3.1 GENERAL INSTALLATION REQUIREMENTS**

- A. Obtain and review the submitted product data for equipment furnished by the Owner, and furnished under other Divisions of this contract, particularly under Divisions 22 and 23.
- B. Confirm the equipment nameplate maximum overcurrent protection (MOCP) and make accommodations and adjustments to switches, fuses and circuit breakers as necessary to coordinate with the nameplate rating.
- C. Install in accordance with manufacturer's instructions.
- D. Provide engraved nameplates per Section 26 05 53, Identification for Electrical Systems.
- E. Provide arc flash labels per Section 26 05 73, Electrical Distribution System Studies.
- F. Apply neatly typed adhesive tag on inside door of each fusible switch indicating NEMA fuse class and size installed.

#### **3.2 TOGGLE TYPE DISCONNECT SWITCHES INSTALLATION**

- A. Install products, systems and equipment in accordance with manufacturer's written instructions and requirements.
- B. See General Installation Requirements above.

#### **3.3 SAFETY SWITCHES INSTALLATION**

- A. Install products, systems and equipment in accordance with manufacturer's written instructions and requirements.
- B. See General Installation Requirements above.

**END OF SECTION**

**SECTION 26 33 23  
CENTRAL BATTERY EQUIPMENT**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Work Included:
  - 1. Components
  - 2. Accessories

**1.2 RELATED SECTIONS**

- A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

**1.4 SUBMITTALS**

- A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.
- B. In addition, provide:
  - 1. Include battery product data.
  - 2. Shop drawings to include battery interconnection schematic diagrams, block diagrams of interconnection of internal elements, input terminals and output circuit breakers.

**1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.
- B. In addition, meet the following:
  - 1. Manufacturer qualifications: Company specializing in manufacturing the products specified in this Section with minimum three years documented experience with service facilities within 100 miles of project.

**1.6 WARRANTY**

- A. Warranty of materials and workmanship as outlined in Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.



## **SECTION 26 33 23 CENTRAL BATTERY EQUIPMENT**

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### **1.7 SYSTEM DESCRIPTION**

- A. Modular battery source inverter system complete with charger, transfer mechanism, integral maintenance bypass and output circuit breakers for purpose as emergency egress lighting backup power sources.
- B. IGBT-based, PWM inverter, 16 kHz switch speed. Suitable for HID, fluorescent and incandescent loads. Recombinant VRLA batteries.
- C. Provide two classes of output, one continuously energized, one energized only upon failure of input source.
- D. Meets UL 924, NFPA 101 and NFPA 111. Materials and installation compliant with state and local adopted Fire Code.

### **1.8 PERFORMANCE**

- A. Environmental Conditions Required: 68 to 85 degrees F for batteries.
- B. Minimum throughput efficiency: 86 percent.
- C. Maximum Audible Noise: 52dBA.
- D. Maximum THD: less than 10 percent at full resistive load.
- E. Unit Power Capacity: 6.0 KW.
- F. Unit Input Voltage: 120/208 V volts, three-phase, 4-wire.
- G. Inverter output frequency: 60 Hz plus 1 percent.
- H. Unit Output Voltage: 120/208 V volts, three-phase, 4-wire.
- I. Maximum recharge time: 12 hours following 1.5 hour discharge.
- J. Physical Size: Maximum 36-inches wide by 72-inches high by 30-inches deep per cabinet. Two cabinets for unit power capacity cited above.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Three Phase:
  - 1. Dual-lite - Trident TRF Series
  - 2. On-Line Power - Power Wave Series
  - 3. Sure-Lites - Lifeway Series
  - 4. Controlled Power Company (CPC) - EON Series



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5. Controlled Power Company (CPC) - TrueLITE Series
  6. Myers Emergency Power Systems - Illuminator Series
  7. Perfect Power Systems - Power Ride Series
- B. Basis of Design: Battery source inverter system on Drawings is designed based on Myers product line. Approved manufacturers are allowed on condition of meeting specified conditions including available space for equipment (including Code required working clearances). Remove and replace electrical equipment installed not meeting these conditions at no cost to Owner.

**2.2 COMPONENTS**

- A. Cabinet:
1. Welded steel, 12 gauge, constructed to NEMA-1 Specifications. Front and back accessibility. Convection cooling vents in enclosure.
  2. Corrosion resistant paint finish.
  3. Hinged, lockable doors.
- B. Inverter:
1. Pulse-width modulated power supply based on IGBT transistors. Dual-conversion with no interruption to load.
  2. Internal maintenance bypass switch, make-before-break.
  3. Overload protection by static bypass switch; system rated to 42,000A symmetric short circuit.
  4. Visual indicator (LED) to indicate inverter operation.
  5. Each module protected against reverse battery polarity.
  6. Each module includes an encapsulated ferroresonant transformer, UL Class H insulation.
- C. Charger:
1. Dual rate design. Constant current voltage limited high rate charge followed by precision float voltage charge for maximum battery capability and life. Charger is temperature compensating to prevent thermal runaway condition with batteries.
  2. Capable of fully recharging batteries within 12 hours following any rated discharge.
  3. Reverse polarity protected.



## SECTION 26 33 23 CENTRAL BATTERY EQUIPMENT

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4. Provide fuse protection for system DC input and charger AC input and DC output.
- D. Monitor:
  1. Monitor AC input for brownout or failure condition. Transfer to battery source when AC input voltage drops below 80 percent of nominal voltage.
  2. Transfer time 30 to 80 milliseconds.
  3. Low battery voltage shutdown set at 87.5 percent of nominal voltage.
- E. Return to Normal Source: Two-minute time delay return to normal source once normal source has been reestablished.
- F. Recombinant VRLA Batteries: Sufficient capacity to output voltage of the inverter for a period of at least 90 minutes at a rated load, without dropping below 87.5 percent nominal battery voltage. 10-year, sealed, lead-calcium. Requires no addition of water over life of battery. Construct case and cover of polypropylene, contain low-pressure safety release vents, and be non-gassing in normal use. 10-year design life expectancy at 77 degrees F. VRLA batteries to include self-resealing flame-arresting caps.
- G. Output Regulation:
  1. 60 Hz plus or minus 1 Hz.
  2. Voltage regulation, plus or minus 6 percent or less from 0 percent to 100 percent of rated load.

### 2.3 ACCESSORIES

- A. Status and Alarm Condition Monitor:
  1. LCD Display to Include:
    - a. AC input voltage.
    - b. DC charger current.
    - c. Output power VA.
    - d. AC output amps.
    - e. DC battery voltage.
    - f. System temperature.
    - g. Output frequency.
  2. Test switch to allow manual test of system without interrupting power to load.



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3. Audible alarm and silence switch to monitor charger and inverter malfunctions and battery electrolyte level.
- B. Output circuit breakers, including normally on circuit breakers, as indicated on Drawings.
- C. Self-Diagnostics:
  1. System to test for 5 minutes every 30 days and for 30 minutes every 6 months. An audible and visible alarm to activate upon:
    - a. Utility failure.
    - b. High temperature.
    - c. Inverter failure.
    - d. Charger failure.
    - e. System overload.
    - f. Output trip alarm.
  2. Output to e-mail for notices to Owner during alarm and trouble conditions.

**PART 3 - EXECUTION**

**3.1 GENERAL INSTALLATION REQUIREMENTS**

- A. Install in accordance with manufacturer's instructions.
- B. Provide a level dry protected area with stable temperature conditions. Install units plumb and level.
- C. Batteries: Install batteries with acid neutralization pillow installed under each battery housing (comply with IFC 608.5.2 or local adopted Fire Code, whichever is more stringent). Enviroguard VRLA Pads or approved equal.
- D. Room installation: Provide room containing central battery system with signage, automatic smoke detection tied to central system (see Division 28) as required by IFC Section 608 or local adopted Fire Code, whichever is more stringent.
- E. Schedules:
  1. Provide output circuit schedule indicating loads connected to each output circuit breaker.
- F. Training:
  1. Provide Owner with minimum 4-hour training session, presented by factory technician, on use and maintenance of battery power system. Videotape training session for future use by Owner.





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- 2. Verify operation of each unit by simulating outage.
- G. Verify operation of each unit by simulating outage.

**3.2 COMPONENTS**

- A. Install per manufacturer's written instructions and requirements.
- B. See General Installation Requirements above.
- C. Provide interconnection between cabinets. Secure cabinets with seismic restraint in accordance with IBC seismic zone classification of area. Confirm requirements with Architect.
- D. Comply with manufacturer's recommendations prior to start-up to prevent physical and electrical damage to components.

**3.3 ACCESSORIES**

- A. Install per manufacturer's written instructions and requirements.
- B. See General Installation Requirements above.
- C. Connect pager, cell phone, fax to dial phone number as directed by Owner, printing out status report during alarm or trouble condition.
  - 1. Utility power is lost.
  - 2. Fire alarm system goes into alarm.
  - 3. Security system goes into alarm.

**END OF SECTION**

**SECTION 26 51 00  
LIGHTING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Work Included:
  - 1. Luminaires
  - 2. LED Drivers
  - 3. Lamps
  - 4. Lighting Poles
- B. Provide wiring for complete and operating lighting system.

**1.2 RELATED SECTIONS**

- A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.
- B. In addition, meet the following:
  - 1. NECA 500 - Commercial Lighting.
  - 2. UL 8750 - Light Emitting Diode (LED) equipment for use in lighting products.

**1.4 SUBMITTALS**

- A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.
- B. In addition, provide:
  - 1. Submit product data for:
    - a. LED Luminaires: Electrical ratings, dimensions, mounting, material, clearances, terminations, wiring, connection diagram, LM-79 photometric data, LM-80 lumen depreciation data.
    - b. LED Drivers
    - c. Lamps
    - d. Lighting Poles

2. Submittal Cutsheets: Highlight, circle or otherwise graphically indicate which option(s) are being selected for the products submitted. Cutsheets that are not edited to indicate which products and options are submitted for this project or that list only catalog numbers to identify submitted options are not acceptable.
3. Specified manufacturers are approved to submit bid. However, inclusion does not relieve manufacturer from supplying product as described.
4. Provide the following operating and maintenance instructions as required by Section 26 00 00, Electrical Basic Requirements:
  - a. Luminaires
  - b. LED Drivers
  - c. Lamps
  - d. Lighting Poles

#### **1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.
- B. In addition, meet the following:
  1. Provide luminaires acceptable to code authority for application and location installed.
  2. Comply with applicable ANSI standards.
  3. Comply with applicable NEMA standards.
  4. Provide luminaires and lampholders that comply with UL standards and have been listed and labeled for location and use indicated by a testing agency acceptable by the AHJ (e.g., UL, ETL, and the like).
  5. Comply with CEC as applicable to installation and construction of luminaires.
  6. Comply with fallout and retention requirements of CBC for diffusers, baffles, and louvers.
  7. Provide LED luminaires from the same manufacturer and manufacturing LED source batch for similar applications (e.g., all LED downlights from a single manufacturer and batch, all linear LED products from single manufacturer and batch).

#### **1.6 WARRANTY**

- A. Warranty as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.



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- B. In addition, provide:
1. LED Luminaire Manufacturer's Warranty: Not less than 5 years for luminaire based on date of substantial completion. Includes normal cost of labor to replace luminaire. Replacement luminaire will match physical dimensions, physical appearance, chromaticity, lumen output and photometric characteristics of original installed equipment.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Luminaires:
1. Reference description and manufacturers in Luminaire Schedule on Drawings.
  2. Or approved equivalent.
- B. LED Drivers:
1. Indoor Drivers:
    - a. eldoLED Series
    - b. Advance/Philips
    - c. Osram Sylvania
    - d. Or approved equivalent.
  2. Outdoor Drivers:
    - a. Advance/Philips
    - b. Osram Sylvania
    - c. LG
    - d. Or approved equivalent.
- C. Lamps:
1. LED (Light Emitting Diode) Lamps:
    - a. Nichia
    - b. Cree
    - c. Osram Sylvania
    - d. GE Lumination

- e. Or approved equivalent.
- 2. Unless specific manufacturer not shown on this list is indicated in the Luminaire Schedule.
- 3. Special types as indicated in Luminaire Schedule.
- 4. Or approved equivalent.
- D. Lighting Poles:
  - 1. Reference description and manufacturers in Luminaire Schedule on Drawings.
  - 2. Or approved equivalent.

## **2.2 LUMINAIRES**

- A. Luminaires: Reference description and manufacturers in Luminaire Schedule on Drawings.
- B. Where recessed luminaires are installed in cavities intended to be insulated, provide IC rated luminaires or other code approved installation.
- C. UL label luminaires installed under canopies, roof or open porches, and similar damp or wet locations, as suitable for damp or wet location.
- D. Suspended luminaires: Provide minimum 24-inch adjustability in aircraft cable length where used.
- E. Recessed Luminaires: Frame compatible with ceiling material installed at particular luminaire location. Provide proper factory trim and frame for luminaire to fit location and ceiling material. Verify with Architectural Reflected Ceiling Plan prior to submittals.
- F. Finishes:
  - 1. Manufacturer's standard finish (unless otherwise indicated) over corrosion resistant primer.
  - 2. Interior Light Reflecting Finishes: White or specular finish with not less than 85 percent reflectance.
  - 3. Exterior Finishes: As detailed in Luminaire Schedule or on Drawings. Refer cases of uncertain applicability to Architect for resolution prior to release for fabrication.
- G. Light Transmitting Components:
  - 1. Plastic diffusers, molded or extruded of 100 percent virgin acrylic.
  - 2. Prismatic acrylic, extruded, flat diffusers, 0.125-inch overall thickness, unless otherwise noted.

**H. LED Luminaires:**

1. UL listing of luminaire includes drivers, transformers, enclosures, rated wire, communications devices and accessories needed for a complete and functional system.
2. LM-79: Testing and measurement of absolute photometry, chromaticity (CCT) and luminaire power. Report provided by DOE certified independent testing laboratory. CCT as specified in Luminaire Schedule.
3. Standards: ANSI C78.377, LM-79 and LM-82 compliant for performance characteristics, photometry, colorimetry, efficacy and thermal characteristics.
4. LM-80 + TM-21: Testing and measurement, and statistical prediction of LED lamp life. Report provided by DOE certified independent testing laboratory.
5. LEDs in one module/luminaire: Supplied from same batch/bin and fall within 3-step MacAdam Ellipse, or as described in Luminaire Schedule, whichever is the more stringent requirement.
6. Provide luminaires with integral LED thermal management system (heat sinking).
7. Luminaires to be equipped with an LED driver that accepts 120V through 277V, 50Hz to 60Hz (universal). Component-to-component wiring within the luminaire will carry no more than 80 percent of rated current and be listed by UL for use at 600VAC at 302 degrees F/150 degrees C or higher. Plug disconnects to be listed by UL for use at 600VAC, 15A or higher.
8. Provide luminaires with individual LED arrays/modules and drivers that are accessible and replaceable from exposed side of the luminaire.

**2.3 LED DRIVERS**

**A. General:**

1. Performance: Meet dimming range called out in Luminaire Schedule, free from perceived flicker or visible stroboscopic flicker, smooth and continuous change in level (no visible steps in transitions), natural square law response to control input, and stable when input voltage conditions fluctuate over what is typically experienced in a commercial environment. Demonstration of this compliance to dimming performance will be necessary for substitutions or prior approval.
2. Ten-year expected life while operating at maximum case temperature and 90 percent non-condensing relative humidity.
3. Minimum efficiency of 85 percent, power factor greater than or equal to 0.90, compliance with reduction of hazardous substances (RoHS). Rated for operating temperature range of area in which driver is installed.
4. Limit inrush current to minimize breaker tripping.



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- a. Base specification: NEMA 410 standard for inrush current for electronic drivers.
    - b. Preferred Specification: Meet or exceed 30 milliamp-squared-seconds at 277VAC for up to 50 watts of load and 75 amps at 240 microseconds at 277VAC for 100 watts of load.
  5. Withstand up to a 1,000 volt surge without impairment of performance as defined by ANSI C62.41 Category A.
  6. No visible change in light output with a variation of plus/minus 10 percent line voltage input.
  7. Total Harmonic Distortion less than 10 percent and meet ANSI C82.11 maximum allowable THD requirements at full output. THD at no point in the dimming curve allows imbalance current to exceed full output THD.
  8. Support automatic adaptation, allowing for future luminaire upgrades and enhancements and deliver improved performance:
    - a. Adjustment of forward LED voltage, supporting 3V through 55V.
    - b. Adjustment of LED current from 150mA to 1.4A at the 100 percent control input point in increments of 1mA.
    - c. Adjustment for operating hours to maintain constant lumens (within 5 percent) over the 50,000 hour design life of the system, and deliver up to 20 percent energy savings early in the life cycle.
  9. Operate for a (+/- 10 percent) supply voltage of 120V through 277VAC at 60Hz.
  10. UL Recognized under the component program and modular for simple field replacement. Drivers that are not UL Recognized or not suited for field replacement will not be considered.
  11. Ability to provide no light output when the analog control signal drops below 0.3 V, or the DALI/DMX digital signal calls for light to be extinguished and consume 0.5 watts or less in this standby. Control dead band between 0.3V and 0.65V included to allow for voltage variation of incoming signal without causing noticeable variation in luminaire to luminaire output.
- B. Light Quality:
1. Over the entire range of available drive currents, driver to provide step-free, continuous dimming to black from 100 percent to 0.1 percent and 0 percent relative light output, or 100 percent to 1 percent light output and step to 0 percent where indicated. Driver to respond similarly when raising from 0 percent to 100 percent.
    - a. Driver must be capable of 20 bit dimming resolution for white light LED drivers or 15 bit resolution for RGBW LED drivers.

2. Driver must be capable of configuring a linear or logarithmic dimming curve, allowing fine grained resolution at low light levels.
  3. Drivers to track evenly across multiple luminaires at all light levels, and must have an input signal to output light level that allows smooth adjustment over the entire dimming range.
  4. Driver and luminaire electronics to deliver illumination that is free from objectionable flicker as measured by flicker index (ANSI/IES RP-16-10). At all points within the dimming range from 100 percent to 0.1 percent luminaire will have:
    - a. LED dimming driver to provide continuous step-free, flicker free dimming similar to incandescent source.
    - b. Base specification: Based on IEEE PAR1789, minimum output frequency should be greater than 1250 Hz.
    - c. Preferred specification: Flicker index to be equal to incandescent, less than 1 percent at all frequencies below 1000 Hz.
- C. Control Input:
1. Provide control protocol to match lighting control system specified for use with luminaire.
  2. 4-Wire (0-10V DC Voltage Controlled) Dimming Drivers:
    - a. Meet IEC 60929 Annex E for General White Lighting LED drivers.
    - b. Connect to devices compatible with 0 to 10V Analog Control Protocol, Class 2, capable of sinking 0.6 ma per driver at a low end of 0.3V. Limit the number of drivers on each 0-10V control output based on voltage drop and control capacity.
    - c. Meet ESTA E1.3 for RGBW LED drivers.

## **2.4 LAMPS**

- A. Provide lamps for luminaires.
- B. Provide lamp catalogued for specified luminaire type.
- C. Incandescent Lamps: Not allowed unless noted in Luminaire Schedule.
- D. LED (Light Emitting Diode):
  1. LED manufacturer will include, but not be limited to, light source, luminaire, power supply and control interface with added components as needed for complete and functioning system.



- a. Comply with ANSI chromaticity standard for classifications of color temperature. See Luminaire Schedule for specified LED lamp color and color temperature. UL or ETL listed and labeled.
- b. Luminaire testing per IESNA LM-79 and LM-80 procedures.
- c. Lamp life for white LEDs: 50,000 plus hours with lamp failure occurring when LED produces 70 percent of initial rated lumens.
- d. Lamp life for color LEDs: 30,000 plus hours with lamp failure occurring when LED produces 50 percent of its initial rated lumens.
- e. LED Drivers: Reverse polarity protection, open circuit protection, require no minimum load. Minimum 80 percent efficiency. Class A noise rating.
- f. Dimming: LED system capable of full and continuous dimming.
- g. Correlated Color Temperature (CCT): See Luminaire Schedule for selection of color temperature for each luminaire. Ranges given below reflect maximum allowable tolerances for color temperature range for each nominal CCT.
  - 1) Nominal CCT:
    - (a) 2700 K (2725 ± 145)
    - (b) 3000 K (3045 ± 175)
    - (c) 3500 K (3465 ± 245)
    - (d) 4000 K (3985 ± 275)
- h. Color Rendering Index (CRI) to be greater than or equal to 80.
- 2. Special types as indicated in Luminaire Schedule.

## **2.5 LIGHTING POLES**

- A. Provide exterior light poles, with concrete bases or direct buried, which are structurally supportive of pole under design loading.
- B. Provide exterior poles clean and scratch free with base bolt covers to match pole and luminaire finish.
- C. Provide poles and pole bases rated for a minimum of 100 MPH, unless otherwise noted. Wind EPA loading for quantity and type of luminaire it supports with a 1.3 gust factor.
- D. Provide poles with gasketed handholes, stainless steel tamper resistant hardware, anchor bolts and ground lugs.
- E. Description:

1. Material: Steel, Aluminum, Treated wood, or Concrete.
2. Shape: Tapered round, Round, or Square.
3. Finish: Galvanized, Primed for field painting, or Anodized.
4. Base: Embedded, Anchor, or Transformer.
5. Accessories: Slipfitter and Mast Arms.

### **PART 3 - EXECUTION**

#### **3.1 GENERAL INSTALLATION REQUIREMENTS**

- A. Install per manufacturer's written installation instructions and requirements.
- B. Install luminaires securely, in neat and workmanlike manner.
- C. Install luminaires of types indicated where shown and at indicated heights in accordance with manufacturer's written instructions and with recognized industry practices to ensure that luminaires comply with requirements and serve intended purposes.
- D. Wiring:
  1. Recessed luminaires to be installed using flexible metallic conduit or MC Cable as allowed by Section 26 05 19 with luminaire conductors spliced to branch circuit conductors in nearby accessible junction box over ceiling. Junction box fastened to building structural member within 6-feet of luminaire.
  2. Luminaires for lift out and removal from ceiling pattern without disconnecting conductors or defacing ceiling materials.
  3. Flexible connections where permitted to exposed luminaires; neat and straight, without excess slack, attached to support device.
  4. Install junction box, flexible conduit and high temperature insulated conductors for through wiring of recessed luminaires.
- E. Relamp luminaires which have failed lamps at substantial completion.
- F. Replace LED drivers deemed as excessively noisy by Architect, Engineer, or Owner.
- G. Install suspended luminaires and exit signs using pendants supported from swivel hangers. Provide pendant length required to suspend luminaire at indicated height.
- H. Support luminaires larger than 2- by 4-foot size independent of ceiling framing.
- I. Locate recessed ceiling luminaires as indicated on architectural reflected ceiling plan.
- J. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prevent movement.

- K. Exposed Grid Ceilings:
  - 1. Support surface mounted luminaires in grid ceiling directly from building structure.
  - 2. Provide auxiliary members spanning ceiling grid members to support surface mounted luminaires.
  - 3. Fasten surface mounted luminaires to ceiling grid members using bolts, screws, rivets, or suitable clips.
- L. Install recessed luminaires to permit removal from below.
- M. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating.
- N. Install clips to secure recessed grid-supported luminaires in place.
- O. Install wall mounted luminaires and exit signs at height as indicated on Architectural Drawings.
- P. Install accessories furnished with each luminaire.
- Q. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.
- R. Bond products and metal accessories to branch circuit equipment grounding conductor.
- S. Install specified lamps in each emergency lighting unit, exit sign, and luminaire.
- T. Coordination:
  - 1. Coordination of Conditions: Coordinate ceiling construction, recessing depth and other construction details prior to ordering luminaires for shipment. Refer cases of uncertain applicability to Architect for resolution prior to release of luminaires for shipment. Where luminaires supplied do not match ceiling construction, replace luminaires at no cost to Owner.
  - 2. Electrical drawings are schematic, identifying quantity and type of luminaires used and their approximate location, but are not to be used for dimensional purposes. Reference architectural drawings for exact locations, including mounting heights.
  - 3. Provide lighting indicated on Drawings with luminaire of the type designated and appropriate for location.
  - 4. Provide LED luminaires with driver compatible to lighting control system as shown in drawings and as specified.
  - 5. Where remote drivers are required, ensure adequate accessibility to driver. Upsize conductors between luminaire and driver to accommodate voltage drop.



## SECTION 26 51 00 LIGHTING

## DIVISION 26

- U. Field Quality Control:
  - 1. Perform field inspection in accordance with Division 01, General Requirements.
  - 2. Operate each luminaire after installation and connection. Inspect for proper connection and operation.
- V. Cleaning:
  - 1. Clean electrical parts to remove conductive and deleterious materials.
  - 2. Remove dirt and debris from enclosures.
  - 3. Clean paint splatters, dirt, dust, fingerprints, and debris from luminaires.
  - 4. Clean photometric control surfaces as recommended by manufacturer.
  - 5. Clean finishes and touch up damaged finishes per by manufacturer's instructions.
- W. Demonstrate luminaire operation for minimum of two hours.

### 3.2 LUMINAIRES INSTALLATION

- A. Install per manufacturer's written installation instructions and requirements.
- B. Align, mount and level luminaires uniformly. Use ball hangers for suspended stem mounted luminaires.
- C. Avoid interference with and provide clearance from equipment. Where indicated locations for luminaires conflict with locations for equipment, change locations for luminaire by minimum distance necessary as directed by Architect.
- D. Suspended Luminaires: Mounting heights indicate clearances between bottom of luminaire and finished floors.
- E. Emergency Egress Luminaires: Provide unswitched circuit for battery charging and autotransfer circuiting for exit signs and luminaires with integral batteries. Where test switch cannot be integral to luminaire, mount remote test switch flush-to-ceiling and adjacent to egress luminaire.
- F. Interior Luminaire Supports:
  - 1. Support Luminaires: Anchor supports to structural slab or to structural members within a partition, or above a suspended ceiling.
  - 2. Maintain luminaire positions after cleaning and relamping.
  - 3. Support luminaires without causing ceiling or partition to deflect.
  - 4. Provide mounting supports for recessed and pendant mounted luminaires as required by IBC.

- G. Adjusting:
1. Aim and adjust luminaires as indicated.
  2. Focus and adjust floodlights, spotlights and other adjustable luminaires, with Architect, at such time of day or night as required.
  3. Align luminaires that are not straight and parallel/perpendicular to structure.
  4. Position exit sign directional arrows as indicated.

### **3.3 LED DRIVERS INSTALLATION**

- A. Install lamps per manufacturer's installation instructions and requirements.
- B. Where driver is remote mounted, size wiring based on type of driver, driver distance from luminaire, and voltage/power level, and manufacturer's installation instructions.
- C. Protect 0-10V input from line voltage mis-connection, and so it will be immune and the output unresponsive to induced AC voltage on the control leads.

### **3.4 LIGHTING POLES INSTALLATION**

- A. Install lighting poles per manufacturer's installation instructions and requirements.
- B. Exterior Luminaire Supports:
1. Provide concrete bases for pole-mounted lighting units and bollard lights at locations shown on site plan drawing(s). Provide concrete bases as shown on drawings or as recommended by manufacturer if not shown on drawings. Minimum base height above grade in automobile areas is 30-inches. Install luminaire poles plumb.
  2. Install pole concrete bases in undisturbed or compacted soil. Where soil is disturbed, provide backfill and compaction per Division 31, Earthwork requirements.

**END OF SECTION**

**SECTION 27 00 00  
COMMUNICATIONS BASIC REQUIREMENTS**

**PART 1 - GENERAL**

**1.1 SECTION INCLUDES**

- A. Work included in 27 00 00, Communications Basic Requirements applies to Division 27, Communications work to provide materials, labor, tools, permits, incidentals, and other services to provide and make ready for Owner's use of communications systems for proposed project.
- B. Contract Documents include, but are not limited to, Specifications including Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Drawings, Addenda, Owner/Architect Agreement, and Owner/Contractor Agreement. Confirm requirements before commencement of work.
- C. Definitions:
  - 1. Provide: To furnish and install, complete and ready for intended use.
  - 2. Furnish: Supply and deliver to project site, ready for unpacking, assembly and installation.
  - 3. Install: Includes unloading, unpacking, assembling, erecting, installation, applying, finishing, protecting, cleaning and similar operations at project site as required to complete items of work furnished.
  - 4. Approved or Approved Equivalent: To possess the same performance qualities and characteristics and fulfill the utilitarian function without any decrease in quality, durability or longevity. For equipment/products defined by the Contractor as "equivalent," substitution requests must be submitted to Engineer for consideration, in accordance with Division 01, General Requirements, and approved by the Engineer prior to submitting bids for substituted items.
  - 5. Authority Having Jurisdiction (AHJ): Indicates reviewing authorities, including local fire marshal, Owner's insurance underwriter, Owner's Authorized Representative, and other reviewing entity whose approval is required to obtain systems acceptance.

**1.2 RELATED SECTIONS**

- A. Contents of Section applies to Division 27, Communications Contract Documents.
- B. Related Work:
  - 1. Additional conditions apply to this Division including, but not limited to:
    - a. Specifications including Division 00, Procurement and Contracting Requirements and Division 01, General Requirements.
    - b. Drawings



**SECTION 27 00 00  
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- c. Addenda
- d. Owner/Architect Agreement
- e. Owner/Contractor Agreement
- f. Codes, Standards, Public Ordinances and Permits

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards per Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, individual Division 27, Communications Sections and those listed in this Section.
- B. Codes to include latest adopted editions, including current amendments, supplements and local jurisdiction requirements in effect as of the date of the Contract Documents, of/from:
  - 1. State of California:
    - a. CALGreen - California Green Building Standards Code (CCR. Title 24, Part 11)
    - b. CBC - California Building Code
    - c. CEC - California Electrical Code
    - d. CEC T24 - California Energy Code Title 24
    - e. CFC - California Fire Code
    - f. CMC - California Mechanical Code
    - g. CPC - California Plumbing Code
    - h. CSFM - California State Fire Marshal
- C. Reference codes, standards and guidelines include but are not limited to the latest adopted editions from:
  - 1. ABA - Architectural Barriers Act
  - 2. ADA - Americans with Disabilities Act
  - 3. CFR – Code of Federal Regulations
  - 4. EPA – Environmental Protection Agency
  - 5. FCC - Federal Communications Commission
  - 6. IBC – International Building Code



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7. IFC – International Fire Code
8. NEC - National Electric Code
9. NESC - National Electrical Safety Code
10. NFPA - National Fire Protection Association
11. OSSC – Oregon Structural Specialty Code
12. OSHA - Occupational Safety and Health Administration

**D. Reference the following standards:**

1. ANSI – American National Standards Institute
2. ASA – American Standards Association
3. ASTM – American Society of Testing and Materials
4. IEEE – Institute of Electrical and Electronics Engineers
5. ISO – International Organization for Standardization
6. NEMA - National Electrical Manufacturers Association
7. TIA - Telecommunications Industry Association
  - a. TIA-526-7-A - Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant
  - b. TIA-526-14-C - Optical Power Loss of Installed Multimode Fiber Cable Plant
  - c. TIA-568.0-E - Generic Telecommunications Cabling for Customer Premises
  - d. TIA-568.1-E - Commercial Building Telecommunications Infrastructure Standard
  - e. TIA-568.2-D - Balanced Twisted-Pair Telecommunications Cabling and Components Standard
  - f. TIA-568.2-D-2 - Balanced Twisted-Pair Telecommunications Cabling and Components Standard, Addendum 2
  - g. TIA-568.3-D - Optical Fiber Cabling Components Standard. Commercial Building Telecommunications Cabling Standard
  - h. TIA-568.3-D-1 - Optical Fiber Cabling Components Standard.
  - i. TIA-568.4-D - Broadband Coaxial Cabling and Components





## SECTION 27 00 00 COMMUNICATIONS BASIC REQUIREMENTS

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- j. TIA-569-E - Commercial Building Standard for Telecommunications Pathways and Spaces
  - k. TIA-570-D - Residential Telecommunications Infrastructure Standard
  - l. TIA-598-D - Optical Fiber Cable Color Coding
  - m. TIA-598-D-1 - Optical Fiber Color Coding in Cable Addendum 1, additional Colors for Elements 3-16
  - n. TIA-598-D-2 - Optical Fiber Cable Color Coding Addendum 2, Jacket Color for OM5 Indoor Fiber Cables
  - o. TIA-606-C - Administration Standard for Commercial Telecommunications Infrastructure
  - p. TIA-607-D - Generic Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications
  - q. TIA-758-B – Customer-Owned OSP Telecom Infrastructure Standard
  - r. TIA-942 - Telecommunications Infrastructure Standard for Data Centers
- E. Reference the following guidelines:
- 1. ASHRAE - Guideline 0, the Commissioning Process
  - 2. ASIS International - American Society for Industrial Security International
  - 3. AVIXA - Audiovisual and Integrated Experience Association.
  - 4. BICSI - Building Industry Consulting Service International
    - a. TDMM - Telecommunications Distribution Methods Manual, 15th Edition
    - b. OSPDRM - Outside Plant Design Reference Manual, 6th Edition
    - c. ITSIMM - Information Technology Systems Installation Manual, 8th Edition

#### 1.4 SUBMITTALS

- A. See Division 01, General Requirements for Submittal Procedures as well as individual Division 27, Communications Sections.
- B. Provide drawings in format and software release equal to the design documents. Drawings to be the same sheet size and scale as the Contract Documents.
- C. In addition:
  - 1. "No Exception Taken" constitutes that review is for general conformance with the design concept expressed in the Contract Documents for the limited purpose of



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checking for conformance with information given. Any action is subject to the requirements of the Contract Documents. Contractor is responsible for the dimensions and quantity and will confirm and correlate at the job site, fabrication processes and techniques of construction, coordination of the work with that of all other trades, and the satisfactory performance of the work.

2. Provide product submittals and shop drawings in electronic format only. Electronic format must be submitted via zip file via e-mail. Provide one file per division containing one bookmarked PDF file with each bookmark corresponding to each Specification Section. Provide a table of contents identifying the products being submitted for each specification section. Arrange bookmarks in ascending order of Specification Section number. Individual submittals sent piecemeal in a per Specification Section method will be returned without review or comment. Copy Architect on all transmissions/submissions. Deviations will be returned without review.
3. Product Data:
  - a. Provide manufacturer's descriptive literature for products specified in Division 27, Communications Sections.
4. Highlight and mark each product in detail. Note what differences, if any, exist between the submitted item and the specified item. Failure to identify the differences will be considered cause for disapproval. If differences are not identified and/or not discovered during the submittal review process, Contractor remains responsible for providing equipment and materials that meet the specifications and Drawings.
  - a. Label submittal to match numbering/references as shown in Contract Documents. Highlight and label applicable information to individual equipment or cross out/remove extraneous data not applicable to submitted model. Clearly note options and accessories to be provided, including field installed items. Highlight connections by/to other trades.
  - b. Provide a red rectangle around part number and description with corresponding red arrow pointing to the item/material being submitted.
  - c. Include technical data, installation instructions, and dimensioned drawings for products, fixtures, equipment and devices installed, furnished or provided. Reference individual Division 27, Communications specification Sections for specific items required in product data submittal outside of these requirements.
  - d. See Division 27, Communications individual Sections for additional submittal requirements outside of these requirements.
5. Maximum of two reviews of complete submittal package. Arrange for additional reviews and/or early review of long-lead items; Bear costs of additional reviews at Engineer's hourly rates. Incomplete submittal packages/submittals will be returned to contractor without review.



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6. Structural/Seismic: Provide weights, dimensions, mounting requirements and like information required for mounting, seismic bracing, and support. Indicate manufacturer's installation and support requirements to meet ASCE 7-16 requirements for non-structural components. Provide engineered seismic drawings and equipment seismic certification. Equipment Importance Factor as specified in Division 01 and in Structural documents.
7. Trade Coordination: Include physical characteristics, electrical characteristics, device layout plans, wiring diagrams, and connections as required per Division 27, Communications Coordination Documents. For equipment with electrical connections, furnish copy of approved submittal for inclusion in Division 26, Electrical submittals.
8. Make provisions for openings in building for admittance of equipment prior to start of construction or ordering of equipment.
9. Substitutions and Variation from Basis of Design:
  - a. The Basis of Design designated product establishes the qualities and characteristics for the evaluation of any comparable products by other listed acceptable manufacturers if included in this Specification or included in an approved Substitution Request as judged by the Design Professional.
  - b. If substitutions and/or equivalent equipment/products are being proposed, it is the responsibility of parties concerned, involved in, and furnishing the substitute and/or equivalent equipment to verify and compare the characteristics and requirements of that furnished to that specified and/or shown. If greater capacity and/or more materials and/or more labor is required for the rough-in, circuitry or connections than for the item specified and provided for, then provide compensation for additional charges required for the proper rough-in, circuitry and connections for the equipment being furnished. No additional charges above the Base Bid, including resulting charges for work performed under other Divisions, will be allowed for such revisions. Coordinate with the requirements of "Submittals." For any product marked "or approved equivalent," a substitution request must be submitted to Engineer for approval prior to purchase, delivery or installation.
10. Shop Drawings:
  - a. Provide coordinated Shop Drawings which include physical characteristics of all systems, device layout plans, and control wiring diagrams. Reference individual Division 27, Communications specification Sections for additional requirements for Shop Drawings outside of these requirements.
  - b. Provide Shop Drawings indicating access panel locations, size and elevation for approval prior to installation.
11. Samples: Provide samples when requested by individual Sections.



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**12. Resubmission Requirements:**

- a. Make corrections or changes in submittals as required in response to Engineer's comments. Provide a cover letter with resubmittal that includes responses to each of the Engineer's submittal review comments and identifies the changes in the resubmittal Cloud changes in the submittals.
  - 1) Resubmit for review until review indicates "no exception taken" or "make corrections as noted."
  - 2) When submitting Drawings for Engineers re-review, clearly indicate changes on Drawings and "cloud" any revisions. Submit a list describing each change.

**13. Operation and Maintenance Manuals, Owner's Instructions:**

- a. Submit, at one time, electronic files (PDF format) of manufacturer's operation and maintenance instruction manuals and parts lists for equipment or items requiring servicing. Submit data when work is substantially complete and in same order format as submittals. Include name and location of source parts and service for each piece of equipment.
  - 1) Include copy of approved submittal data along with submittal review letters received from Engineer. Data to clearly indicate installed equipment model numbers. Delete or cross out data pertaining to other equipment not specific to this project.
  - 2) Include copy of manufacturer's standard Operations and Maintenance for equipment. At front of each tab, provide routine maintenance documentation for scheduled equipment. Include manufacturer's recommended maintenance schedule and highlight maintenance required to maintain warranty. Furnish list of routine maintenance parts, including part numbers, sizes, quantities, relevant to each piece of equipment.
  - 3) Include Warranty per Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 27 00 00, Communications Basic Requirements and individual Sections.
  - 4) Include product certificates of warranties and guarantees.
  - 5) Include copy of complete parts list for equipment. Include available exploded views of assemblies and subassemblies.
  - 6) Include commissioning reports.
  - 7) Include copy of startup and test reports specific to each piece of equipment.



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- 8) Engineer will return incomplete documentation without review. Engineer will provide one set of review comments in Submittal Review format. Contractor must arrange for additional reviews; Contractor to bear costs for additional reviews at Engineer's hourly rates.
  - b. Thoroughly instruct Owner in proper operation of equipment and systems. Where noted in individual Sections, training will include classroom instruction with applicable training aids and systems demonstrations. Submit copy of material used for Owner instruction. Field instruction per Section 27 00 00, Communications Basic Requirements Article titled "Demonstration."
  - c. Copies of certificates of code authority inspections, acceptance, code required acceptance tests, letter of conformance and other special guarantees, certificates of warranties, specified elsewhere or indicated on Drawings.
14. Record Drawings:
- a. Maintain at site at least one set of drawings for recording "as-constructed" conditions. Indicate on Drawings changes to original documents by referencing revision document, and include buried elements, location of conduit, and location of concealed communication items. Include items changed by field orders, supplemental instructions, and constructed conditions.
  - b. Record Drawings are to include equipment and connection schedules that accurately reflect "as constructed or installed" for project.
  - c. At completion of project, input changes to original project on CAD Drawings and make one set of black-line Drawings created from CAD Files in version/release equal to Contract Drawings. Submit CAD Files and Drawings upon substantial completion.
  - d. Record drawings solely referencing field orders, supplemental instructions, etc. without any revision markups based on the change responses are not acceptable.
  - e. Provide a full-size laminated copy of the overall single line diagram(s) to permanently affix at the Main electrical Room or Engineering Office that is readily visible by onsite personnel.
  - f. Invert elevations and dimensioned locations for incoming utilities and site raceways below grade extending to 5-feet outside building line.
  - g. See Division 27, Communications individual Sections for additional items to include in Record Drawings.

### 1.5 QUALITY ASSURANCE

- A. Regulatory Requirements:



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1. Work and materials installed to conform with all local, State and Federal codes, and other applicable laws and regulations. Where code requirements are at variance with Contract Documents, meet code requirements as a minimum requirement and include costs necessary to meet these in Contract. Machinery and equipment are to comply with OSHA requirements, as currently revised and interpreted for equipment manufacturer requirements. Install equipment provided per manufacturer recommendations.
- B. Whenever this Specification calls for material, workmanship, arrangement, or construction of higher quality and/or capacity than that required by governing codes, higher quality and/or capacity take precedence.
- C. Drawings are intended to be diagrammatic and reflect the Basis of Design manufacturer's equipment. They are not intended to show every item in its exact dimensions, or details of equipment or proposed systems layout. Verify actual dimensions of systems (i.e., conduit) and equipment proposed to assure that systems and equipment will fit in available space. Contractor is responsible for design and construction costs incurred for equipment other than Basis of Design, including, but not limited to, architectural, structural, electrical, HVAC, fire sprinkler, and plumbing systems.
- D. Manufacturer's Instructions:
  1. Follow manufacturer's written instructions. If in conflict with Contract Documents, obtain clarification. Notify Engineer/Architect, in writing, before starting work.
- E. Items shown on Drawings are not necessarily included in Specifications or vice versa. Confirm requirements in all Contract Documents.
- F. Making, supervising, or directing the making of an electrical installation which does not meet minimum safety standards is not allowed.
- G. Except as authorized by the Authority Having Jurisdiction, do not remove, transfer, alter or otherwise tamper with an inspection permit, label, tag, or other indication of inspection placed on or at an electrical job site, electrical installation, or electrical product.

#### **1.6 WARRANTY**

- A. Provide written warranty covering the work for a period of one year from date of Substantial Completion in accordance with Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 27 00 00, Communications Basic Requirements and individual Division 27, Communications Sections.
- B. Sections under this Division can require additional and/or extended warranties that apply beyond basic warranty under Division 01, General Requirements and the General Conditions. Confirm requirements in all Contract Documents.

#### **1.7 COORDINATION DOCUMENTS**

- A. Prior to construction, prepare and submit coordinated layout drawings (composite drawings), to coordinate installation and location of HVAC equipment, ductwork, grilles, diffusers, piping, plumbing equipment/fixtures, fire sprinklers, plumbing, lights, cable tray



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and electrical services with architectural and structural requirements, and other trades (including plumbing, fire protection, electrical, ceiling suspension, and tile systems), and provide maintenance access requirements. Coordinate with submitted architectural systems (i.e. roofing, ceiling, finishes) and structural systems as submitted, including footings and foundation. Identify zone of influence from footings and ensure systems are not routed within the zone of influence.

- B. Coordination drawings to be provided for the following systems, at a minimum, for review and approval:
  - 1. Routing of Raceways and Boxes
- C. Prepare Drawings as follows:
  - 1. Drawings in CAD Format. CAD format release equal to design documents. Drawings to be same sheet size and scale as Contract Drawings and indicate location, size and elevation above finished floor of equipment and distribution systems.
  - 2. Review and revise, as necessary, section cuts in Contract Drawings after verification of field conditions.
  - 3. Incorporate addenda items and change orders.
  - 4. Provide additional coordination as requested by other trades.
- D. Advise Architect in event conflict occurs in location or connection of equipment. Bear costs resulting from failure to properly coordinate installation or failure to advise Architect of conflict.
- E. Submit final Coordination Drawings with changes as Record Drawings at completion of project.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Articles, fixtures, and equipment of a kind to be standard product of one manufacturer.

### 2.2 STANDARDS OF MATERIALS AND WORKMANSHIP

- A. Base contract upon furnishing materials as specified. Materials, equipment, and fixtures used for construction are to be new, latest products as listed in manufacturer's printed catalog data and are to be UL or ETL listed and labeled or be approved by State, County, and City authorities prior to procurement and installation.
- B. Names and manufacturer's names denote character and quality of equipment desired and are not to be construed as limiting competition.
- C. Hazardous Materials:



## **SECTION 27 00 00 COMMUNICATIONS BASIC REQUIREMENTS**

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1. Comply with local, State of Oregon, and Federal regulations relating to hazardous materials.
2. Comply with Division 00, Procurement and Contracting Requirements and Division 01, General Requirements for this project relating to hazardous materials.
3. Do not use any materials containing a hazardous substance. If hazardous materials are encountered, do not disturb; immediately notify Owner and Architect. Hazardous materials will be removed by Owner under separate contract.

### **PART 3 - EXECUTION**

#### **3.1 ACCESSIBILITY AND INSTALLATION**

- A. Confirm Accessibility and Installation requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 27 00 00, Communications Basic Requirements and individual Division 27, Communications Sections.
- B. Install equipment requiring access (i.e., amplifiers, taps, zone controllers, volume controls, and storage devices) so that they may be serviced, reset, replaced or recalibrated by service people with normal service tools and equipment. Do not install equipment in obvious passageways, doorways, scuttles or crawlspaces which would impede or block intended usage.
- C. Install equipment and products complete as directed by manufacturer's installation instructions. Obtain installation instructions from manufacturer prior to rough-in of equipment and examine instructions thoroughly. When requirements of installation instructions conflict with Contract Documents, request clarification from Architect prior to proceeding with installation. This includes proper installation methods, sequencing and coordination with other trades and disciplines.
- D. Temporary Power:
  1. Design of temporary power for construction is the responsibility of the Contractor. Remove temporary power prior to completion of Project.
- E. Earthwork:
  1. Confirm Earthwork requirements in Contract Documents. In absence of specific requirements, comply with individual Division 27, Communications Sections and the following:
    - a. Perform excavation, dewatering, shoring, bedding, and backfill required for installation of work in this Division in accordance with related earthwork divisions. Contact utilities and locate existing utilities prior to excavation. Repair any work damaged during excavation or backfilling.
    - b. Excavation:





## SECTION 27 00 00 COMMUNICATIONS BASIC REQUIREMENTS

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- 1) Do not excavate under footings, foundation bases, or retaining walls.
  - c. Provide protection of underground systems. Review the project Geotechnical Report for references to corrosive or deleterious soils which will reduce the performance or service life of underground systems materials.
- F. Firestopping:
1. Confirm Firestopping requirements in Division 07, Thermal and Moisture Protection. In absence of specific requirements, comply with individual Division 27, Communications Sections and the following:
    - a. Coordinate location and protection level of fire and/or smoke rated walls, ceilings, and floors. When these assemblies are penetrated, seal around piping, ductwork and equipment with approved firestopping material. Install firestopping material complete as directed by manufacturer's installation instructions. Meet requirements of ASTM E814, Standard Test Method for Fire Tests of Through-Penetration Fire Stops.
- G. Plenums:
1. In plenums, provide plenum rated materials that meet the requirements to be installed in plenums. Immediately notify Architect/Engineer of discrepancy.
- H. Start up equipment, in accordance with manufacturer's start-up instructions, and in presence of manufacturer's representative. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.
- I. Provide miscellaneous supports/metals required for installation of equipment and conduit.
- J. Provide necessary permits and cover costs associated with inspections required for the work.

### 3.2 SEISMIC CONTROL

- A. Confirm Seismic Control requirements in Division 01, General Requirements, Structural documents, and individual Division 27 Communications Sections.
- B. General:
1. Earthquake resistant designs for Communications (Division 27) equipment and distribution, i.e. cabinets and racks, ceiling assemblies, raceways, ladder racking, etc. to conform to regulations of jurisdiction having authority.
  2. Restraints which are used to prevent disruption of function of piece of equipment because of application of horizontal force to be such that forces are carried to frame of structure in such a way that frame will not be deflected when apparatus is attached to a mounting base and equipment pad, or to structure in normal way, utilizing attachments provided. Secure equipment and distribution systems to



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withstand a force in direction equal to value defined by jurisdiction having authority.

3. Provide stamped Shop Drawings from licensed Structural Engineer of seismic bracing and seismic movement assemblies for cabinets, racks, major equipment and overhead raceways. Engineer to design and provide stamped Shop Drawings cabinets, racks, major equipment and overhead raceway. Submit Shop Drawings along with equipment submittals.
4. Provide stamped Shop Drawings from licensed Structural Engineer of seismic flexible joints for piping and crossing building expansion or seismic joints. Submit Shop Drawings along with seismic bracing details.
5. Provide stamped Shop Drawings from licensed Structural Engineer of seismic flexible joints for piping and crossing building expansion or seismic joints. Submit Shop Drawings along with seismic bracing details.
6. Provide means to prohibit excessive motion of communications equipment during earthquake.

### **3.3 REVIEW AND OBSERVATION**

- A. Confirm Review and Observation requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 27 00 00, Communications Basic Requirements and individual Division 27, Communications Sections.
- B. Notify Architect, in writing, at following stages of construction so that they may, at their option, visit site for review and construction observation:
  1. Underground conduit installation prior to backfilling.
  2. Prior to ceiling cover/installation.
  3. When main systems, or portions of, are being tested and ready for inspection by AHJ.
- C. Final Punch: Costs incurred by additional trips required due to incomplete systems will be the responsibility of the Contractor.

### **3.4 CUTTING AND PATCHING**

- A. Confirm Cutting and Patching Requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with individual Division 27, Communications Sections and the following:
  1. Proposed floor cutting/core drilling/sleeve locations to be approved by Project Structural Engineer. Submit proposed locations to Architect/Project Structural Engineer. Where slabs are of post tension construction, perform x-ray scan of proposed penetration locations and submit scan results including proposed penetration locations to Project Structural Engineer/Architect for approval. Where



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slabs are of waffle type construction, show column cap extent and cell locations relative to proposed penetration(s).

2. Cutting, patching and repairing for work specified in this Division including plastering, masonry work, concrete work, carpentry work, and painting included under this Section will be performed by skilled craftsmen of each respective trade in conformance with appropriate Division of Work.
3. Additional openings required in building construction to be made by drilling or cutting. Use of jack hammer is specifically prohibited. Patch openings in and through concrete and masonry with grout.
4. Restore new or existing work that is cut and/or damaged to original condition. Patch and repair specifically where existing items have been removed. This includes repairing and painting walls, ceilings, etc. where existing conduit and devices are removed as part of this project. Where alterations disturb lawns, paving, and walks, surfaces to be repaired, refinished and left in condition matching existing prior to commencement of work.
5. Additional work required by lack of proper coordination will be provided at no additional cost to the Owner.

#### **3.5 EQUIPMENT SELECTION AND SERVICEABILITY**

- A. Replace or reposition equipment which is too large or located incorrectly to permit servicing, at no additional cost to Owner.

#### **3.6 DELIVERY, STORAGE AND HANDLING**

- A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with individual Division 27, Communications Sections and the following:
  1. Handle materials delivered to project site with care to avoid damage. Store materials on site inside building or protected from weather, dirt and construction dust. Insulation and lining that becomes wet from improper storage and handling to be replaced before installation. Products and/or materials that become damaged due to water, dirt and/or dust as a result of improper storage to be replaced before installation.
  2. Protect all equipment and conduit to avoid damage. Close conduit openings with caps or plugs. Keep motors and bearings in watertight and dustproof covers during entire course of installation.

#### **3.7 DEMONSTRATION**

- A. Confirm Demonstration requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 27 00 00, Communications Basic Requirements and individual Division 27, Communications Sections.



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- B. Upon completion of work and adjustment of equipment and test systems, demonstrate to Owner's Authorized Representative, Architect and Engineer that equipment furnished and installed or connected under provisions of these Specifications functions in manner required. Provide field instruction to Owner's Maintenance Staff as specified in Division 01, General Requirements, Section 27 00 00, Communications Basic Requirements and individual Division 27, Communications Sections.
- C. Manufacturer's Field Services:
  - 1. Furnish services of a qualified person at time approved by Owner, to instruct maintenance personnel, correct defects or deficiencies, and demonstrate to satisfaction of Owner that entire system is operating in satisfactory manner and complies with requirements of other trades that may be required to complete work. Complete instruction and demonstration prior to final job site observations.

### **3.8 CLEANING**

- A. Confirm Cleaning requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 27 00 00, Communications Basic Requirements and individual Division 27, Communications Sections.
- B. Upon completion of installation, thoroughly clean exposed portions of equipment, removing temporary labels and traces of foreign substances. Throughout work, remove construction debris and surplus materials accumulated during work.

### **3.9 INSTALLATION**

- A. Confirm Installation requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 27 00 00, Communications Basic Requirements and individual Division 27, Communications Sections.
- B. Install equipment and devices in accordance with manufacturer's installation instructions, plumb and level and firmly secured to mounting surfaces. Maintain manufacturer's recommended clearances.
- C. Start up equipment, in accordance with manufacturer's start-up instructions, and in presence of manufacturer's representative. Test operation and demonstrate compliance with requirements. Replace damaged or malfunctioning equipment.
- D. Provide miscellaneous supports/metals required for installation of equipment.

### **3.10 PAINTING**

- A. Confirm Painting requirements in Division 01, General Requirements and Division 09, Finishes. In absence of specific requirements, comply with individual Division 27, Communications Sections and the following:
  - 1. Ferrous Metal:
    - a. After completion of communications work, thoroughly clean and paint exposed supports constructed of ferrous metal surfaces in



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telecommunications rooms, i.e., hangers, hanger rods, equipment stands, with one coat of black asphalt varnish for exterior or black enamel for interior, suitable for hot surfaces.

2. In a telecommunications room, on roof or other exposed areas, equipment not painted with enamel to receive two coats of primer and one coat of rustproof enamel, colors as selected by Architect. Fire rated plywood backboards to receive two coats of fire retardant paint on all six sides; color to be white.
3. See individual equipment Specifications for other painting.
4. Structural Steel:
  - a. Repair damage to structural steel finishes or finishes of other materials damaged by cutting, welding or patching to match original.
5. Conduit:
  - a. Clean, primer coat and paint interior conduit exposed in finished areas with two coats paint suitable for metallic surfaces. Color selected by Architect.
6. Covers:
  - a. Covers such as handholes, maintenance holes, vaults, pullboxes and the like will be furnished with finishes which resist corrosion and rust. Covers shall be identified with 'COMMUNICATIONS'. It is the contractor's responsibility to proactively seek and obtain approval with Owner prior to purchasing and prior to installation for terms of satisfaction.

### 3.11 ACCEPTANCE

- A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with individual Division 27, Communications Sections and the following:
  1. System cannot be considered for acceptance until work is completed and demonstrated to Architect that installation is in strict compliance with Specifications, Drawings and manufacturer's installation instructions, particularly in reference to following:
    - a. Testing Reports, as outlined in their respective Division sections
    - b. Cleaning
    - c. Operation and Maintenance Manuals
    - d. Training of Operating Personnel
    - e. Record Drawings, including cabling identifications, symbols, and locations



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- f. Warranty and Guaranty Certificates, including extended manufacturer's warranties
- g. Start-up/test Documents and Commissioning Reports

**3.12 FIELD QUALITY CONTROL**

- A. Confirm Field Quality Control requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 27 00 00, Communications Basic Requirements and individual Division 27, Communications Sections.
- B. Tests:
  - 1. Conduct tests of equipment and systems to demonstrate compliance with requirements specified. Reference individual Specification Sections for required tests. Document tests and include in Operation and Maintenance Manuals. All cabling test results shall be included.
  - 2. During site evaluations by Architect or Engineer, provide appropriate personnel with tools to remove and replace trims, covers, and devices so that proper evaluation of installation can be performed.

**3.13 LETTER OF CONFORMANCE**

- A. Provide Letter of Conformance, copies of manufacturers' warranties and extended warranties with a statement that Communications items were installed in accordance with manufacturer's recommendations, and UL listings and approvals. Include Letter of Conformance, copies of manufacturers' warranties and extended warranties in Operation and Maintenance Manuals.

**END OF SECTION**

**SECTION 27 11 00  
COMMUNICATIONS EQUIPMENT ROOM FITTINGS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Work Included:
  - 1. Communications Equipment Racks
  - 2. Patch Panels
  - 3. Cable Management
  - 4. Cable Runway
  - 5. Fire Retardant Plywood Backboard

**1.2 RELATED SECTIONS**

- A. Contents of Division 27, Communications and Division 01, General Requirements apply to this Section.
- B. Contents of Division 26, Electrical may apply to this Section.
- C. In addition, reference the following:
  - 1. Section 27 00 00, Communications Basic Requirements
  - 2. Section 27 13 00, Communications Backbone Cabling
  - 3. Section 27 15 00, Communications Horizontal Cabling

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 27 00 00 Communications Basic Requirements and Division 01, General Requirements.
- B. Adhere to the most recent published edition of codes, rules, regulations, standards, manufacturer's instructions, or requirements of regulatory agencies as of the contract date. Promptly notify telecom engineer of any discrepancies between construction documents or conditions and the stipulated codes, standards, guidelines, and specifications. In case of conflicts, the more stringent requirement must take precedence.
- C. Abbreviations and Acronyms:
  - 1. AFF – Above Finished Floor
  - 2. ICT– Information and Communication Technology
  - 3. RU – Rack Unit



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- 4. TR – Telecommunications Room
- 5. UL – Underwriters Laboratories

**D. Definitions:**

- 1. ICT Cabling: The standardized infrastructure used to connect various ICT devices, such as computers, servers, phones, and other network equipment, within a building or across a campus.
- 2. Rack Unit: A standardized measurement unit used to describe the height of electronic equipment designed to fit into a 19-inch or 23-inch wide server rack or enclosure. It is primarily used to standardize the height of equipment such as servers, network switches, and other hardware commonly installed in data centers and telecommunications rooms.
- 3. Telecommunications Room: A dedicated space within a building that houses equipment, cable terminations, and cross-connects used to manage and interconnect telecommunications services, such as data, security, and AV. It typically serves as a consolidation point for horizontal cabling that connects to various workstations on the same floor and may include patch panels, equipment racks, and active equipment such as network switches.
- 4. Underwriters Laboratories: a global safety certification company that establishes safety standards and provides testing, inspection, and certification services for a wide range of products and systems. The organization is known for evaluating products for safety, quality, and performance, particularly in the fields of electrical equipment, building materials, and fire safety.

**1.4 SUBMITTALS**

- A. Submittals as required by Section 27 00 00, Communications Basic Requirements and Division 01, General Requirements.
- B. Work must not begin until shop drawings and submittals are approved.
  - 1. The intent of submitting shop drawings and submittals for approval is for contractors to display a conceptual understanding of the construction documents.
- C. Contractors must request drawing backgrounds from the Architect and create shop drawings using their own Titleblock. Shop drawings that copy construction documents will be rejected.
- D. Submittals and Shop Drawings must be approved four weeks prior to ordering products.
- E. In addition, provide:
  - 1. Product Data Cut Sheets:
    - a. Provide manufacturer's cut sheets with a red arrow and highlighted part numbers even if cut sheet has only one part number associated.





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2. Shop Drawings that include, but are not limited to the following:
  - a. Telecommunications Room layout
  - b. Telecommunications Room wall elevations
  - c. Equipment rack elevations
  - d. Backbone and conduit riser diagrams
  - e. Device locations on floor plans
  - f. Cable pathways and routing
  - g. Installation Details
- F. Submittal Requirements at Closeout:
  1. Provide as-built drawings with room layouts, rack elevations, and device locations with labeling.
- G. Substitutions:
  1. Substitutions must conform to the general requirements as outlined in Section 27 00 00, Communications Basic Requirements.

**1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Section 27 00 00, Communications Basic Requirements and Division 01, General Requirements.
- B. Pre-Construction Meeting:
  1. Contractor must initiate a virtual or on-site pre-construction meeting to discuss installation procedures.
- C. Installer Qualifications:
  1. Contractor specializing in performing work of this section with a minimum of three years documented experience.
  2. Contractor must be certified by the manufacturer to install the design components.
- D. Regulatory Requirements:
  1. Installation must comply with applicable building codes and regulations.

**1.6 WARRANTY**

- A. Warranty of materials and workmanship as required by Section 27 00 00, Communications Basic Requirements and Division 01, General Requirements.



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- B. The contractor's warranty of the physical installation must be valid for a period of no less than 1 year.

**1.7 SYSTEM DESCRIPTION**

- A. The Telecommunications Room is designed to accommodate racks, cabinets, and equipment essential for supporting the ICT cabling infrastructure and other systems.
- B. Provide a complete and operational Telecommunications Room, including all related equipment, cabling, and support infrastructure.
- C. The installation must support current and anticipated future telecommunications and data networking requirements.

**PART 2 – PRODUCTS**

**2.1 MANUFACTURERS**

- A. Communications Equipment Racks:
  - 1. Chatsworth
  - 2. Legrand
  - 3. Panduit
  - 4. Or engineer approved equivalent
- B. Patch Panels:
  - 1. Belden
  - 2. CommScope
  - 3. Leviton
  - 4. Panduit
  - 5. Or engineer approved equivalent
- C. Cable Management:
  - 1. Chatsworth
  - 2. Legrand
  - 3. Panduit
  - 4. Or engineer approved equivalent
- D. Cable Runway:



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1. Chatsworth
  2. Legrand
  3. Panduit
  4. Or engineer approved equivalent
- E. Fire Retardant Plywood Backboard
1. Pyro-Guard
  2. ProWood FR
  3. Or engineer approved equivalent

**2.2 COMMUNICATIONS EQUIPMENT RACKS**

- A. Provide a stable and secure equipment rack for mounting and organization of telecommunications equipment and cabling.
- B. Mount:
1. Floor
  2. Wall
- C. Material:
1. Constructed from steel or aluminum with a powder-coated finish for durability and corrosion resistance
- D. Dimensions:
1. Floor-Mount Equipment Rack:
    - a. Height:
      - 1) 45 RU (7-feet)
    - b. Width:
      - 1) 19-inch
  2. Wall-Mount Equipment Rack:
    - a. Height:
      - 1) 20 RU (41-inch)
      - 2) 40 RU (76-inch)



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- b. Width:
  - 1) 19-inch
- E. Finish:
  - 1. Black, powder-coating
  - 2. White, powder-coating
- F. Standard:
  - 1. UL Listed

**2.3 PATCH PANELS**

- A. For use in a Telecommunications Room to manage and organize the termination of horizontal cabling in an equipment rack.
- B. Patch Panels:
  - 1. Cable Rating:
    - a. Category 6
    - b. Category 6A
  - 2. Color:
    - a. Black
    - b. White
  - 3. Layout:
    - a. Angled
    - b. Flat
  - 4. Port Count:
    - a. 24
    - b. 48
  - 5. Rack Units:
    - a. 1 RU
    - b. 2 RU
  - 6. Termination Type:



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- a. Modular
- 7. Wiring Scheme:
  - a. T568B

**2.4 CABLE MANAGEMENT**

- A. Provide a designated pathway for cables to prevent entanglement while ensuring cables are accessible and protected from physical damage.
- B. Horizontal Cable Manager:
  - 1. Material:
    - a. Constructed from high-strength steel or plastic with a durable finish.
  - 2. Dimensions:
    - a. Height:
      - 1) 1 RU
      - 2) 2 RU
    - b. Width:
      - 1) 19-inch
  - 3. Finish:
    - a. Black
    - b. White
- C. Vertical Cable Manager:
  - 1. Material:
    - a. Constructed from high-strength steel or plastic with a durable finish.
  - 2. Dimensions:
    - a. Height:
      - 1) 45 RU (7-feet)
    - b. Width:
      - 1) 6-inch
      - 2) 10-inch



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- 3) 12-inch
- 3. Finish:
  - a. Black
  - b. White

**2.5 CABLE RUNWAY**

- A. Provide cable runway overhead, or vertically mounted on the wall to support and manage ICT cabling within a Telecommunications Room.
- B. Materials:
  - 1. Rectangular steel tubing with welded cross members at 9-inch intervals.
- C. Dimensions:
  - 1. Height:
    - a. 1.5-inch
  - 2. Width:
    - a. 12-inch
    - b. 18-inch
    - c. 24-inch
  - 3. Length:
    - a. 10-feet
- D. Finish:
  - 1. Black
- E. Standard:
  - 1. UL Listed
- F. Cable Runway Accessories:
  - 1. Triangular Support Bracket
  - 2. Cable Runway Elevation Kit
  - 3. Vertical Wall Brackets
  - 4. Cable Runway Foot Kit



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5. Cable Runway Butt Splice Kit
6. Cable Runway Junction Splice Kit
7. Cable Runway Wall Angle Support Kit
8. Cable Runway Radius Drop Stringer
9. Cable Runway Cross Member Radius Drop
10. Earthquake Bracing Kit
11. Cable Retaining Posts
12. Protective End Caps

**2.6 FIRE RETARDANT PLYWOOD BACKBOARD**

- A. Provide a stable and secure surface for mounting telecommunications equipment.
- B. Material:
  1. ACX grade, void-free, fire-retardant plywood
- C. Dimensions:
  1. Height:
    - a. 8-feet
  2. Width:
    - a. 4-feet
  3. Depth:
    - a. 0.75-inch
- D. Fire Rating:
  1. Fire-retardant treated to meet local fire code requirements
- E. Finish:
  1. Paint two (2) coats of light-colored fire-retardant paint
- F. Hardware:
  1. Provide screws, bolts, washers, anchors, and other fasteners as recommended by the manufacturer or structural engineer.



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**PART 3 – EXECUTION**

**3.1 GENERAL INSTALLATION REQUIREMENTS**

- A. Provide contents of this Section from a single manufacturer to provide manufacturer warranty.
- B. Prior to installation verify Telecommunications Room is ready to receive the components described in this section and confirm the environmental conditions are suitable for installation.
- C. Make floor penetrations no more than 4 inches from walls. Extend conduit stubs 4 inches above floor base and cap for protection.
- D. Seismic installation requires additional bracing of racks/cabinets and overhead cable runways to the building structure as recommended and certified by a licensed structural engineer.
- E. Labeling:
  - 1. General Requirements:
    - a. Rack labeling must comply with TIA-606-C Administration Standard.
    - b. Provide two label plates per rack and permanently affix to the top center of rack.
    - c. Submit labeling schemes to Engineer for approval prior to testing and labeling.

**3.2 COMMUNICATIONS EQUIPMENT RACKS**

- A. Reference 3.01, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.
- C. Layout equipment rack location on floor of Telecommunications Room as shown on drawings and obtain written approval from engineer or owner prior to rack installation.
- D. Position equipment rack with a minimum of three feet of clearance in front and back.
- E. Assemble equipment rack according to manufacturer's instructions.
- F. Fasten equipment rack to Telecommunications Room floor using manufacturer's suggested anchoring method.
- G. Provide required seismic bracing for rack.
- H. Provide required accessories of rack from a single manufacturer.
- I. Provide required seismic bracing for racks.





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**3.3 PATCH PANELS**

- A. Reference 3.01, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.
- C. Mount patch panels in designated equipment racks or cabinets at the specified rack unit indicator as shown on the enlarged telecom room elevation drawings.
- D. Cable pair twist must be maintained to the termination point to ensure optimal signal integrity and performance.
- E. Cable sheath must be maintained up to 0.5-inches of the patch panel.
- F. Utilize horizontal and vertical cable management systems to route and organize cables to and from the patch panel and secure with Velcro strips.
- G. Leave adequate service loops for future changes or maintenance without exceeding the bend radius or straining the cables.

**3.4 CABLE MANAGEMENT**

- A. Reference 3.01, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.

**3.5 CABLE RUNWAY**

- A. Reference 3.01, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.
- C. Install cable runway 6-inches from walls to not impede the code-required vertical clearance for wall-mounted electrical panels.
- D. Install cable runways as shown on drawings, and field engineer as needed to assure proper placement.
- E. Cut to length cable runway section with a minimum number of splice points. Make field cuts using the manufacturer's recommended equipment.
- F. Provide seismic bracing for cable runway.

**3.6 FIRE RETARDANT PLYWOOD BACKBOARD**

- A. Reference 3.01, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.
- C. Apply two coats of fire-resistant paint to six sides of the plywood backboard. Before painting mask all fire rating stamps with painter's tape so the fire stamp is visible to the inspector.



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- D. Mount plywood backboard vertically 8-inches AFF where shown on drawings with smooth "A" surface facing outward.
- E. Install plywood backboard plumb, level, and secure to walls.
- F. Anchors for attaching backboards include but are not limited to the following:
  - 1. Concrete or Masonry:
    - a. Expansion anchors
    - b. Concrete screws
  - 2. Wood Studs:
    - a. Lag bolts
  - 3. Metal Studs:
    - a. Toggle bolts.
- G. Use of power drive anchors, molly bolts, and tappets are prohibited.

**END OF SECTION**

**SECTION 27 15 00  
COMMUNICATIONS HORIZONTAL CABLING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Work Included:
  - 1. Horizontal Cabling
  - 2. Modular Connectors
  - 3. Telecommunication Outlets
  - 4. Patch Cords
  - 5. Labeling
  - 6. Velcro Cable Ties

**1.2 RELATED SECTIONS:**

- A. Contents of Division 27, Communications and Division 01, General Requirements apply to this Section.
- B. In addition, reference the following:
  - 1. Section 27 00 00, Communications Basic Requirements
  - 2. Section 27 11 00, Communications Equipment Room Fittings

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 27 00 00, Communications Basic Requirements and Division 01, General Requirements.
- B. Adhere to the most recent published edition of codes, rules, regulations, standards, manufacturer's instructions, or requirements of regulatory agencies as of the contract date. Promptly notify telecom engineer of any discrepancies between construction documents or conditions and the stipulated codes, standards, guidelines, and specifications. In case of conflicts, the most stringent requirements must take precedence.
- C. In addition, meet the following:
  - 1. Provide system wiring in accordance with good engineering practices as established by the Telecommunications Industry Association (TIA), the National Electrical Code (NEC), and the Building Industry Consulting Services International (BICSI).
- D. Abbreviations and Acronyms:



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1. 8P8C – Eight Position Eight Contact
2. ANSI – American National Standards Institute
3. AWG – American Wire Gauge
4. BICSI – Building Industry Consulting Services International
5. CMR – Communications Multipurpose Riser
6. CMP – Communications Multipurpose Plenum
7. IEEE – Institute of Electrical and Electronics Engineers
8. ICT – Information and Communications Technology
9. ISO – International Organization for Standardization
10. RU – Rack Unit
11. RCDD – Registered Communications Distribution Designer
12. TR – Telecommunications Room
13. TIA – Telecommunications Industry Association
14. UL – Underwriters Laboratories

**E. Definitions:**

1. 8P8C: Eight Positions, Eight Contacts – Commonly referred to as “RJ-45” is a type of connector commonly used in network cabling for Ethernet and other applications
2. Category 6: Twisted-pair cable that supports data speeds up to 1 Gbps and a frequency of 250 MHz
3. Category 6A: Twisted-pair cable that supports data speeds up to 10 Gbps and a frequency of 500 MHz
4. CMR: Communications riser cable listed as being suitable for use in a vertical run or a shaft when penetrating one or more floors.
5. CMP: Communications plenum cable listed as being suitable for use in ducts, plenums, and other spaces used for environmental air
6. ICT Cabling: The standardized infrastructure used to connect various ICT devices, such as computers, servers, phones, and other network equipment, within a building or across a campus.
7. Rack Unit: A standardized measurement unit used to describe the height of electronic equipment designed to fit into a 19-inch or 23-inch wide server rack or enclosure. It is primarily used to standardize the height of equipment such as



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servers, network switches, and other hardware commonly installed in data centers and telecommunications rooms.

8. Telecommunications Room: A dedicated space within a building that houses equipment, cable terminations, and cross-connects used to manage and interconnect telecommunications services, such as data, security, and AV. It typically serves as a consolidation point for horizontal cabling that connects to various workstations on the same floor and may include patch panels, equipment racks, and active equipment such as network switches.

**1.4 SUBMITTALS**

- A. Submittals as required by Section 27 00 00, Communications Basic Requirements and Division 01, General Requirements.
- B. Work must not begin until shop drawings and submittals are approved.
  1. The intent of submitting shop drawings and submittals for approval is for contractors to display a conceptual understanding of the Construction Documents.
- C. Contractors must request drawing backgrounds from the Architect and create shop drawings using their own Titleblock. Shop drawings that copy construction documents will be rejected.
- D. Submittals and Shop Drawings must be approved four weeks prior to ordering products.
- E. In addition, provide:
  1. Product Data Cut Sheets:
    - a. Provide manufacturer's cut sheets with a red arrow and highlighted part numbers even if cut sheet has only one part number associated.
  2. Shop Drawings that include, but are not limited to the following:
    - a. Device locations on floor plans
    - b. Cable pathways and routing
    - c. Installation Details
- F. Substitutions:
  1. Substitutions must conform to the general requirements as outlined in Section 27 00 00, Communications Basic Requirements.
- G. Submittal Requirements at Closeout:
  1. Provide "As-Built Drawings:

- a. Drawings must indicate locations of all equipment including but not limited to telecommunication outlets, patch panels, telecom/security/AV equipment on each sector drawing, and identifiers.
  - b. As-built drawings must show all Telecommunication Outlets with numbering.
  - c. Place a laminated full-size, minimum "C" sized, floor plan of these drawings (coordinate with Owner) on the wall of each telecommunications room (TR), showing area covered, data locations, and cable labeling.
  - d. Provide owner with a PDF and/or Revit model for the final as-built to adequately maintain current conditions for all future adds, moves, and changes.
2. Horizontal Cabling Test Results:
    - a. Provide a detailed test report for each cable run, including test results with a pass/fail status.
    - b. Failing cable runs must be reinstalled or repaired and retested, at the expense of the contractor that installed the failing cable.
  3. O&M Manual.
  4. Manufacturer's 25-year warranty certificate.
  5. Electronic files in raw native tester software format, pdf, and hard copy documentation of test results for every cable and cable segment and link in three-ring binder.

### **1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Section 27 00 00, Communications Basic Requirements and Division 01, General Requirements.
- B. Regulatory Requirements:
  1. Installation must comply with applicable building codes and regulations.
- C. Pre-Construction Meeting:
  1. Contractor must initiate a virtual or on-site pre-construction meeting to discuss installation procedures.
- D. Installer Qualifications:
  1. Contractor specializing in performing work of this section with a minimum of three years documented experience.
  2. Contractor must be certified by the manufacturer to install the components of the design.



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**1.6 WARRANTY**

- A. Warranty of materials and workmanship as required by Section 27 00 00, Communications Basic Requirements and Division 01, General Requirements.
- B. The Contractor's warranty of the physical installation must be valid for a period of no less than 1 year.
- C. The Contractor must administer the warranty process with the responsible manufacturer's representative. Ensure that the manufacturer provides the owner with the appropriate warranty certification within ninety calendar days of the final project completion.
- D. Certification or warranty of the structured cabling system must be issued directly by the manufacturer and certified by an authorized representative of the manufacturer. This warranty must include:
  - 1. Warranty period of no less than 25 years assuring that cabling system will perform as specified for the duration.
  - 2. Warranty must cover both parts and labor costs associated with any necessary repairs or replacements within coverage range.
  - 3. Warranty must guarantee that horizontal cabling system will meet or exceed performance criteria specified for its category in accordance with TIA-568 standards.
  - 4. Installation must be performed by a contractor who is certified by selected manufacturer. Certification by manufacturer's representative ensures compliance with manufacturer installation practices and quality standards.
  - 5. Contractor must replace any horizontal cable that is damaged or installed outside recommended parameters at no cost to Owner.

**PART 2 – PRODUCTS**

**2.1 MANUFACTURERS**

- A. Horizontal Cabling:
  - 1. Belden
  - 2. CommScope
  - 3. Leviton
  - 4. Panduit
  - 5. Or engineer approved equivalent
- B. Modular Connectors:
  - 1. Belden



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2. CommScope
  3. Leviton
  4. Panduit
  5. Or engineer approved equivalent
- C. Telecommunication Outlets:
1. Belden
  2. CommScope
  3. Leviton
  4. Panduit
  5. Or engineer approved equivalent
- D. Patch Cords:
1. Belden
  2. CommScope
  3. Leviton
  4. Panduit
  5. Or engineer approved equivalent
- E. Labeling:
1. Panduit
  2. Or engineer approved equivalent
- F. Velcro Cable Ties:
1. Belden
  2. CommScope
  3. Leviton
  4. Panduit
  5. Or engineer approved equivalent

**2.2 HORIZONTAL CABLING**

- A. Category 6 CMR Rated Cabling:





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1. For use in indoor spaces, within ceilings and walls, and raised floors.
  2. Conductors:
    - a. Solid copper
    - b. 23 AWG
    - c. Four color-coded twisted pairs
  3. Cable Jacket:
    - a. CMR with UL 1666 flame rating
  4. Cable Color:
    - a. Black
    - b. Blue
    - c. White
- B. Category 6 CMP Rated Cabling:**
1. For use in indoor plenum spaces, within drop ceilings, or below raised floors where air circulation for heating, ventilation, and air conditioning occurs.
  2. Conductors:
    - a. Solid copper
    - b. 23 AWG
    - c. Four color-coded twisted pairs
  3. Cable Jacket:
    - a. CMP with UL 910 flame rating
  4. Cable Color:
    - a. Black
    - b. Blue
    - c. White
- C. Category 6 Indoor/Outdoor CMR Rated Cabling:**
1. For use in indoor and/or outdoor spaces, in-slab or under-slab conduit runs, underground or direct burial. Can also be used in industrial and harsh environments such as manufacturing plants and marine applications.



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2. Conductors:
    - a. Solid copper
    - b. 23 AWG
    - c. Four color-coded twisted pairs
  3. Cable Jacket:
    - a. CMR with UL 1666 flame rating
  4. Cable Color:
    - a. Black
- D. Category 6 Indoor/Outdoor CMP Rated Cabling:
1. For use in plenum indoor and/or outdoor spaces, in-slab or under-slab conduit runs, underground or direct burial. Can also be used in industrial and harsh environments such as manufacturing plants and marine applications.
  2. Conductors:
    - a. Solid copper
    - b. 23 AWG
    - c. Four color-coded twisted pairs
  3. Cable Jacket:
    - a. CMP with UL 910 flame rating
  4. Color:
    - a. Black
- E. Category 6A CMR Rated Cabling:
1. For use in indoor spaces, within ceilings and walls, and raised floors.
  2. Conductors:
    - a. Solid copper
    - b. 23 AWG
    - c. Four color-coded twisted pairs
  3. Cable Jacket:
    - a. CMR with UL 1666 flame rating



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4. Color:
  - a. Black
  - b. Blue
  - c. White
- F. Category 6A CMP Rated Cabling:
  1. For use in indoor plenum spaces, within drop ceilings, or below raised floors where air circulation for heating, ventilation, and air conditioning occurs.
  2. Conductors:
    - a. Solid copper
    - b. 23 AWG
    - c. Four color-coded twisted pairs
  3. Cable Jacket:
    - a. CMP with UL 910 flame rating
  4. Cable Color:
    - a. Black
    - b. Blue
    - c. White
- G. Category 6A Indoor/Outdoor CMR Rated Cabling:
  1. For use in indoor and/or outdoor spaces, in-slab or under-slab conduit runs, underground or direct burial. Can also be used in industrial and harsh environments such as Manufacturing Plants and Marine applications.
  2. Conductors:
    - a. Solid copper
    - b. 23 AWG
    - c. Four color-coded twisted pairs
  3. Cable Jacket:
    - a. CMR with UL 1666 flame rating
  4. Cable Color:



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- a. Black
- H. Category 6A Indoor/Outdoor CMP Rated Cabling:
  - 1. For use in plenum indoor and/or outdoor spaces, in-slab or under-slab conduit runs, underground or direct burial. Can also be used in industrial and harsh environments such as Manufacturing Plants and Marine applications.
  - 2. Conductors:
    - a. Solid copper
    - b. 23 AWG
    - c. Four color-coded twisted pairs
  - 3. Cable Jacket:
    - a. CMP with UL 910 flame rating
  - 4. Color:
    - a. Black

**2.3 MODULAR CONNECTORS**

- A. 8P8C Modular Connectors for Termination of Horizontal Cabling:
  - 1. Connector used to terminate horizontal cabling to Telecommunication Outlets and/or patch panels.
  - 2. Cable Rating:
    - a. Category 6 unshielded
    - b. Category 6A unshielded
  - 3. Wiring Scheme:
    - a. T568B
  - 4. Color:
    - a. Blue
    - b. Ivory
    - c. White
- B. 8P8C Modular Plug Terminated Link:
  - 1. For use in terminating horizontal cabling directly to a modular plug.



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2. Cable Rating:
  - a. Category 6
  - b. Category 6A
3. Type:
  - a. Unshielded

**2.4 TELECOMMUNICATION OUTLETS**

**A. Faceplates for Standard Telecom Outlets:**

1. Must be suitable for indoor installation and compatible with 1-gang or 2-gang backboxes.
2. Faceplates could have one, two, three, four, six, or eight ports.
3. Must include blank inserts for unused ports.
4. Labels and label windows
5. Color:
  - a. Ivory
  - b. Stainless Steel
  - c. White
  - d. Coordinate with architect

**B. Surface Mounted Outlets:**

1. Must be suitable for indoor installation and compatible with specified connectors
2. Outlet could have one, or two ports
3. Must include blank insert for unused ports
4. Label and label windows
5. Color:
  - a. Ivory
  - b. Stainless Steel
  - c. White



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**2.5 PATCH CORDS**

- A. For use in a Telecommunications Room or at the Telecommunications Outlet to connect devices to a structured cabling system.
- B. Patch cords must meet or exceed the highest performance component of the channel.
- C. Patch cords must consist of 4-pair, balanced twisted-pair cables enclosed within a single jacket with factory-terminated 8P8C (RJ-45) plug modules on both ends.
- D. Telecommunications Room Patch Cords:
  - 1. Cable Rating:
    - a. Category 6
    - b. Category 6A
  - 2. Color:
    - a. Black
    - b. Blue
    - c. White
  - 3. Conductor Size:
    - a. 23 AWG
    - b. 24 AWG
    - c. 28 AWG
  - 4. Length:
    - a. 5 feet – provide 10 percent of installed patch panel ports
    - b. 7 feet – provide 80 percent of installed patch panel ports
    - c. 10 feet – provide 10 percent of installed patch panel ports
  - 5. Type:
    - a. Unshielded
  - 6. Wiring Scheme:
    - a. T568B
- E. Telecommunications Outlet Patch Cords:
  - 1. Cable Rating:



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- a. Category 6
  - b. Category 6A
2. Color:
  - a. Black
  - b. Blue
  - c. White
3. Conductor Size:
  - a. 23 AWG
  - b. 24 AWG
  - c. 28 AWG
4. Length:
  - a. 10 feet – provide 60 percent of installed modular connectors
  - b. 15 feet – provide 25 percent of installed modular connectors
  - c. 20 feet – provide 15 percent of installed modular connectors
5. Type:
  - a. Unshielded
6. Wiring Scheme:
  - a. T568B

**2.6 LABELING**

- A. Labels must be consistent in format and application across the structured cabling system, easily readable and permanent, resist environmental conditions like moisture, heat, and UV exposure, and adhere to TIA-606-C standards.
- B. Horizontal Cable Labels:
  1. Labels must fit comfortably around the cable leaving space for the text to be visible.
  2. Material:
    - a. Vinyl self-laminating
  3. Sizes:



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- a. 1-inch x 0.5-inch
  - b. 1.5-inch x 0.75-inch
  - c. 2-inch x 1-inch
- 4. Color:
  - a. Background – White
  - b. Font – Black
- C. Telecommunication Outlet Faceplate Labels:
  - 1. Use labels provided with the faceplate.
- D. Patch Panel Labels:
  - 1. Each port must be labeled to correspond with the label at the work area.
  - 2. Material:
    - a. Vinyl
    - b. Polyester
    - c. Laminated
  - 3. Sizes:
    - a. 0.25-inch x 1.5-inch
    - b. 0.5-inch x 1.75-inch
    - c. 0.75-inch x 2-inch
  - 4. Color:
    - a. Background – White
    - b. Font – Black

**2.7 VELCRO CABLE TIES**

- A. For use in organizing and securing horizontal cabling.
- B. Velcro Cable Ties:
  - 1. Color:
    - a. Black
    - b. Blue





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- c. White
- d. Match horizontal cabling
- 2. Size:
  - a. 0.75-inch

**PART 3 - EXECUTION**

**3.1 GENERAL INSTALLATION REQUIREMENTS**

- A. Install horizontal cabling in compliance with TIA-568 standards.
- B. Ensure horizontal cabling is routed in accordance with approved drawings, using pathways designated for telecommunications use.
- C. Maintain proper cable bend radius and support intervals according to manufacturer's specifications.
- D. Contractor must be a certified installer for the selected manufacturer(s) prior to, during, and throughout the completion of the system installation and must be able to provide the manufacturer's extended warranty.
- E. Provide items from a single manufacturer including, but not limited to, connectors, patch panels, patch cords, and face plates.
- F. Prior to cable installation, ensure cable pathways are dry, clean, and clear of debris.
- G. Provide materials necessary for a complete and working system.
- H. Establish requirements for plenum-rated cables and devices. If uncertain, obtain a written determination from the AHJ prior to product purchase or submittal. Without written confirmation from the AHJ, the Contractor must assume that a plenum rating is required.
- I. Do not exceed the manufacturer's specified pulling tension limits during installation.
- J. Use of zip ties or any other cable type tie other than Velcro is prohibited.
- K. Cable Routing and Support:
  - 1. Maintain the following minimum separation distances between pathways for copper horizontal cabling and power wiring rated at 480 volts or less:
    - a. Open or Nonmetal Telecommunications Pathways:
      - 1) Maintain a distance of 12-inches from electric motors, fluorescent fixtures, and unshielded power lines carrying up to 3kVa.
      - 2) Maintain a distance of 36-inches from electrical equipment and unshielded power lines carrying more than 5 kVa.



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- 3) Maintain a distance of 48-inches from large electrical motors or transformers.
- b. Grounded Metal Conduit Telecommunications Pathways:
  - 1) Maintain a distance of 2.5-inches from electrical equipment and unshielded power lines carry up to 2 kVa.
  - 2) Maintain a distance of 6-inches from electrical equipment and unshielded power lines carrying from 2 kVa to 5 kVa.
  - 3) Maintain a distance of 12-inches from electrical equipment and unshielded power lines carrying more than 5 kVa.
  - 4) Maintain a distance of 3-inches from power lines enclosed in a grounded metal conduit (or equivalent shielding) carrying from 2 kVa to 5 kVa.
  - 5) Maintain a distance of 6-inches from power lines enclosed in a grounded metal conduit (or equivalent shielding) carrying more than 5 kVa.
2. Use approved cable supports and management systems, such as J-hooks or cable trays.
3. Horizontal cabling must have a dedicated support structure. Cables must be continuously supported (e.g., conduit, cable tray) or supported at intervals not exceeding 5-feet using J- hooks. Cables must not come in contact with suspended ceiling and should be installed at a minimum of 6-inches above any part of the suspended ceiling. Neither the suspended ceiling nor its support wires can be used to support cabling.
4. Ensure horizontal cabling is installed with no bends tighter than four times the cables' outside diameter throughout the entire run.
- L. Firestopping:
  1. Install firestopping materials around horizontal cable penetrations through fire-rated walls and floors, following manufacturer recommendations and local fire codes.
  2. Ensure firestopping material is compatible with the materials being used (e.g., drywall, concrete).
- M. Testing and Certification:
  1. Testing Procedures:
    - a. Perform testing in accordance with TIA-568.2-D standards, TIA-1152-A (for field testing of twisted-pair cabling), and project specifications.



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- b. Use test equipment that is compliant with the latest TIA standards, properly calibrated, and suitable for testing the specified category of cabling (e.g., Cat 6, Cat 6A).
  - c. Utilize a Level IIIe or higher field tester for Cat 6 and Cat 6A installations or as specified for other cable categories.
- 2. Test Parameters:
  - a. Mandatory Tests:
    - 1) Wire Map
    - 2) Length
    - 3) Insertion Loss
    - 4) Return Loss
    - 5) Near-End Crosstalk (NEXT)
    - 6) Power Sum Near-End Crosstalk (PSNEXT)
    - 7) Attenuation-to-Crosstalk Ratio (ACR)
    - 8) Propagation Delay and Delay Skew
    - 9) Resistance
- 3. Submit test results in PDF format for approval to the engineer or project manager. Test results must include the following information at minimum:
  - a. Project Name
  - b. Date of test
  - c. Technician Name
  - d. Circuit ID
  - e. Test Result of "Pass" or "Fail"
- 4. Any cable failing to meet performance criteria must be repaired or replaced and retested at no additional cost to the Owner.
  - a. Document corrective actions taken for failed tests, including details of repairs and retesting outcomes.

**3.2 HORIZONTAL CABLING**

- A. Reference 3.01, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.

- C. Install cables in uninterrupted lengths from the Telecommunications Room to the Work Area; splicing is prohibited.
- D. Use of cable-pulling compounds is prohibited for interior installations.
- E. Maximum horizontal cable length from termination in the Telecommunications Room to the termination point in work area (permanent link) must not exceed 90-meters (295 ft).

### **3.3 MODULAR CONNECTORS**

- A. Reference 3.01, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.
- C. Cable pair twist must be maintained to the termination point to ensure optimal signal integrity and performance.
- D. Cable sheath must be maintained up to 0.5-inches of the modular connector.
- E. Modular Connector rating must match category of cabling being installed.

### **3.4 TELECOMMUNICATION OUTLETS**

- A. Reference 3.01, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.
- C. Standard faceplate height is typically 18-inches from finished floor for general use and 48-inches for wall phones. See drawings for exact heights.
- D. Install faceplates securely, ensuring they are level and parallel to surrounding receptacles and surfaces.
- E. Ensure faceplates are flush with the wall surface with no gaps or protrusions.
- F. Avoid excessive cable slack and ensure cables are neatly dressed and secured behind faceplate.
- G. Clearly label each faceplate with a permanent and legible label that is visible and easy to read without removing the faceplate or modular connectors.

### **3.5 PATCH CORDS**

- A. Reference 3.01, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.
- C. Distribute patch cords to the Telecommunications Rooms in proportion to the number of patch panel ports terminated in each Telecommunications Room.
- D. Distribute patch cords to the Telecommunications Rooms in proportion to the number of modular connectors terminated in the work areas.



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- E. Field-terminated patch cords are prohibited.

**3.6 LABELING**

- A. Reference 3.01, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.
- C. Label cables, faceplates, racks, bonding busbars, and patch panels according to project labeling scheme.
- D. Horizontal cabling must have a machine-printed label at each end no more than 6-inches from the termination point. The use of handwritten labels is prohibited.

**3.7 VELCRO CABLE TIES**

- A. Reference 3.01, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.
- C. Use Velcro ties to bundle horizontal cabling neatly without over-tightening.
- D. Space Velcro ties evenly along the horizontal cabling bundles, typically every 12 to 18 inches.
- E. Group horizontal cabling into bundles of no more than 50 cables each to prevent excessive heat buildup, maintain proper airflow, and avoid physical deformation.

**END OF SECTION**

**SECTION 27 51 29**  
**EMERGENCY RESPONDER COMMUNICATIONS ENHANCEMENT SYSTEM (ERCES)**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This specification describes performance criteria for deploying a Emergency Responder Communications Enhancement System (ERCES) capable of supporting the Public Safety Network (PSN).
- B. The contractor shall provide all components necessary to ensure a fully operational and code compliant Emergency Responder Communications Enhancement System (ERCES).
- C. This specification does not dictate product selection, it only suggests manufacturers that provide equipment that meets typical ERCES RF and code performance standards. Contractor shall select appropriate equipment solutions to meet RF coverage levels and that also meet Code and reference standard requirements.
- D. ERCES components include, but are not limited to:
  - 1. Bi-Directional Amplifiers (BDA)
  - 2. Fiber Optic Transceiver Unit
  - 3. Fiber Optic Remote Repeaters
  - 4. Donor Antennas
  - 5. Coverage Antennas
  - 6. Coaxial Cable and Coax Connectors
  - 7. Splitters, Combiners, and Couplers, Surge Arrestors
  - 8. Battery Backup Units
  - 9. Alarming Components and Annunciation

**1.2 RELATED SECTIONS**

- A. Contents of Division 27, Communications and Division 01, General Requirements apply to this Section.
- B. In addition, reference the following:
  - 1. Division 26 Electrical Generators and Backup Systems
  - 2. Section 27 13 00, Communications Backbone Cabling



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**1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 27 00 00, Communications Basic Requirements and Division 01, General Requirements.
- B. In addition, meet the following:
  - 1. NFPA 70 2019
  - 2. NFPA 72 2019
  - 3. NFPA 1221 2019
  - 4. NFPA 5000 2015
  - 5. Federal Communications Commission (FCC) - Title 47 of the Code of Federal Regulations, Part 90
  - 6. Federal Communications Commission (FCC) Rules, Parts 15 and 22
  - 7. ANSI/TIA-568.3-D-1: Optical Fiber Cabling Components Standards - General Updates 2019
  - 8. ANSI/TIA-568.3-D: Optical Fiber Cabling Components Standards (October 2016)
  - 9. ANSI/TIA-569-E: Commercial Building Standard for Telecommunications Pathways and Spaces (May 2019)
  - 10. ANSI/TIA-606-C: The Administration Standard for the Telecommunications Infrastructure of Commercial Building (July 2017)
  - 11. ANSI/TIA-J-STD-607-D: Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications (July 2019)
  - 12. BICSI Information Transport Systems Installation Methods Manual
  - 13. BICSI Telecommunications Distribution Methods Manual

**1.4 SUBMITTALS**

- A. Submittals as required by Section 27 00 00, Communications Basic Requirements and Division 01, General Requirements.
- B. Submittal Requirements Prior to Start of Construction:
  - 1. Certificates:
    - a. An FCC-issued general radio operators license (GROL) for the ERCES Integrator.
    - b. A certificate from the manufacturer of the equipment to be installed stating that the ERCES Integrator is trained/qualified on the equipment.



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2. Acceptance Test Plan (ATP): The contractor shall submit an ATP that has been accepted by the customer or customer's designated representative.
3. Floor plans showing the location of system components.
4. Final RF link budget.
5. Detail Drawings for donor antenna and grounding.
6. RF propagation modeling (heat maps).
7. Product data sheets for each type of equipment to be installed.
8. Permit drawings as required by the AHJ to include:
  - a. Three sets of Shop Quality plans, 1/8-inch scale minimum.
  - b. One product submittal packet.
9. Test Equipment:
  - a. Submit certificates indicating that staff is certified on required test equipment.
  - b. Submit current calibration data for test equipment to be used.
  - c. Submit certificates indicating that staff is certified on required test equipment including by not necessarily limited to:
    - 1) Signal Generators
    - 2) Spectrum Analyzers
    - 3) PIM Testers

**C. Submittal Requirements at Close Out:**

1. Drawings: Submit as-built drawings indicating:
  - a. Cable routing, splitters, couplers and coverage antenna locations
  - b. Active component locations, layout and configuration
2. Test Reports:
  - a. PSN: Submit Accepted ATP reports confirming the requirements of Section 1.4 have been met.
  - b. Cable Test Reports: Submit cable test results for all cable segments. Testing shall include Return Loss (RL), Distance to Fault (DTF) and Passive Intermodulation (PIM).





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3. Operation and Maintenance Data: Submit hardware and software manuals for all active components.
4. Acceptance Certificate or Document from the AHJ.
5. Warranty Documents:
  - a. Submit for all manufactured components specified in this Section.
  - b. Submit Contractor's System Warranty.
  - c. Submit Manufacturer's Extended Warranty.

**1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Section 27 00 00, Communications Basic Requirements and Division 01, General Requirements.
- B. In addition, meet the following:
  1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
  2. The work specified in this Section is acknowledged to require special skills mastered by education, experience, or both. Bidders for work described in this Section shall be or will subcontract with established ERCES/RF communications contractors. The contractor shall have direct access to all tools and test equipment required to complete the work prior to submitting a bid.
  3. Requirements set forth by first-responder code, ordinance, or the PSN AHJ shall supersede the requirements described herein and shall be met in their entirety. It is the Contractor's responsibility to ensure that the ERCES complies with local code, ordinances or requirements established by the PSN AHJ.
  4. PSN Approval
    - a. When approval of the ERCES deployment is required by code or ordinance, the Contractor shall be responsible for facilitating the AHJ approval(s) per the requirements of the code or ordinance.

**1.6 WARRANTY**

- A. Warranty of materials and workmanship as required by Section 27 00 00, Communications Basic Requirements and Division 01, General Requirements.
- B. In addition, provide:
  1. Manufacturer Warranty:
    - a. Splitters, Couplers and Coverage Antennas: 5-year limited warranty from date of system acceptance.



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- b. Fiber Optic and Coaxial Cable and Connectors: 10-year limited warranty from date of system acceptance.
- c. Active Components: The earliest of 1-year limited warranty from date of system installation or 15 months from date of shipment.

**1.7 SYSTEM DESCRIPTION**

- A. Services: Upon Acceptance Testing, the ERCES shall provide coverage for the PSNs listed below on all frequencies currently being used by the designated PSNs in the given market.
- B. Separate Infrastructures. The PSN ERCES shall be deployed on a cabling and antenna infrastructure that is segregated from the components supporting Cellular, paging and facility radio system.
- C. Services Supported. The ERCES infrastructure shall be designed to support the services described in Table 1 below.
  - 1. Table 1 - Services Supported on the ERCES:
    - a. Sample table shown below. ERCES Integrator to coordinate all required frequencies of the system with the local AHJ.

Service	Uplink, MHz	Downlink, MHz
700MHz PSN Band	793 - 805	763 - 775
800 Band	806 - 824	851 - 869

- D. PSN Coordination/Approval:
  - 1. The Contractor shall propose and deploy a ERCES capable of receiving approval of the PSN Authority Having Jurisdiction (AHJ).
  - 2. The Contractor shall coordinate and submit all documentation required for AHJ approval.
  - 3. If the AHJ requires, the contractor shall confirm with AHJ and include the required documentation for AHJ approval that shall include a coverage survey for existing conditions (without the ERCES) and with the ERCES.
- E. Broadband Active Distribution: Single-mode fiber-optic cable will be used for active distribution. In-line amplifiers are not allowed.
- F. System Management:
  - 1. SMS: The ERCES shall have a Systems Management System (SMS) capable of alarm, monitor, configuration and control of all Active Components.

**1.8 PERFORMANCE REQUIREMENTS**

- A. Public Safety Network (PSN) ERCES:



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1. Contractors shall state the assumed channel count for the PSN Frequency Bands identified above with submittal of bid response. Prior to installation, contractors shall confirm the channel count and all frequencies required within a jurisdiction with the AHJ and shall guarantee coverage for these channels per the criteria stated above.
2. The ERCES shall deliver coverage per the criteria in Table 2 throughout 95 percent of all occupied building spaces and 99 percent in critical areas as defined in NFPA 1221.
3. Although NFPA 1221 only requires testing to DAQ of 3.0, the system must also meet the minimum RSSI of -95dBm as measured by a calibrated spectrum analyzer.

B. Table 2 - System Parameters PSN:

Parameters	Units	Public Safety 800 MHz
Minimum Downlink RSL	DBM	-95

1. The ERCES shall be capable of upgrade, without additional hardware or software, to allow for changes to system frequencies within the deployed frequency band in order to maintain radio system coverage as originally designed.

**1.9 ABBREVIATIONS**

- A. AGC: Automatic Gain Control
- B. AHJ: Authority Having Jurisdiction
- C. ATP: Acceptance Test Plan
- D. BBU: Baseband Unit
- E. BDA: Bi-Direction Amplifier
- F. BOM: Bill-of-Material
- G. CW: Continuous Wave
- H. dBm: Decibel Milliwatt
- I. ERCES: Emergency Responder Communications Enhancement System
- J. ESMR: Enhanced Specialized Mobile Radio
- K. FCC: Federal Communications Commission
- L. GROL: General Radio Operators License
- M. GUI: Graphical User Interface



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- N. LMR: Land Mobile Radio
- O. MTBF: Mean Time Between Failure
- P. NFPA: National Fire Protection Association
- Q. NMS: Network Management System
- R. PSN: Public Safety Network
- S. RoF: Radio-over-Fiber
- T. RoHS: Restriction of Hazardous Substances
- U. RRU: Remote Radio Unit
- V. RSSI: Received Signal Strength Indicator
- W. RSL: Received Signal Level
- X. SISO: Single-Input, Single-Output
- Y. SMR: Specialized Mobile Radio
- Z. SMS: Short Message Service
- AA. SNIR: Signal-to-Noise Interference Ratio
- BB. SNMP: Simple Network Management Protocol
- CC. SOW: Statement of Work
- DD. VSWR: Voltage Standing Wave Ratio

**1.10 DEFINITIONS**

- A. Acceptance: Expressed approval by the customer.
- B. Active: ERCES components that require AC/DC power for operation.
- C. Carrier Approval: Expressed approval to interconnect to the WSP macro network.
- D. Channel: A path for an RF transmission between two points.
- E. Component: A main system element of the ERCES.
- F. Contractor: The prime contractor bidding the project.
- G. Passive: ERCES components that do not require AC/DC power for operation.



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**1.11 MAINTENANCE**

- A. The Contractor shall provide a maintenance service contract, covering the system for a period of one-year with options up to five years: preventative maintenance, system monitoring, spares, fault mitigation, equipment repair, and response time.
- B. Annual Testing:
  - 1. As required by Code, the system shall be tested annually beginning one year from the date of final acceptance testing. The contractor or systems integrator shall provide a price for an additional service contract to include the required annual testing as described in Part 3 below.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Subject to compliance with requirements, provide products by one of the following:
  - 1. ADRF
  - 2. Comba
  - 3. CommScope
  - 4. DAS Alert
  - 5. SOLiD
  - 6. Times Microwave
  - 7. Westell
  - 8. Or approved equal.

**2.2 GENERAL**

- A. All backbone, antenna distribution, radiating, and any fiber-optic cables must be rated as plenum cables.

**PART 3 - EXECUTION**

**3.1 INSTALLATION**

- A. The contractor shall design, install, commission and test the ERCES in accordance with the manufacturer's instructions and recommendations.
- B. All ERCES cabling shall be installed in survivable pathway complying with the survivability requirements of the 2019 NFPA 72/1221.
- C. Locate equipment, antennas and splitters at locations shown on the contract drawings.



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- D. Extend cabling from the Fiber Optic Remote Units or BDA to the splitters in a neat and orderly manner per the routing indicated on the contract drawings. Support cabling in compliance with NEC Chapter 8 requirements and manufacturers recommendations.
- E. Maintain a 6-inch minimum distance from the ERCES cabling and other cabling for parallel runs. Do not install coaxial cabling open in any areas where the cabling will subject to physical damage.
- F. Install antennas in or above ceilings per the mounting details shown in the contract documents
- G. Provide 24-hour UPS/battery backup per code unless connected to an on-site generator that has a minimum 24-hour run time.

**3.2 EQUIPMENT MOUNTING**

- A. Install equipment in spaces as indicated on plans in accordance with manufacturer's instructions and seismic requirements.
- B. Install Public Safety Headend equipment - Bidirectional Amplifier, Fiber Optic Transceiver, DC Power Supply in equipment cabinet in space indicated on the drawings. Fasten to the floor per manufacturer's instructions and provide seismic bracing if required in compliance with local codes.
- C. Install BBU per manufacturer's instructions.
- D. Install RRU per manufacturer's instructions.
- E. Install donor antennas per details shown on the contract documents.

**3.3 COORDINATION WITH OTHER TRADES**

- A. Field coordinate the installation of the headend equipment and remotes to ensure that each location is provided with the following:
  - 1. A 120V, 20A circuit served from the life/safety generator system for each UPS and each NEMA 4 enclosure compressor.
  - 2. (2) strands of single mode fiber from the head end location to each remote location terminated in SC APC connectors at the Headend and LC-APC at the remote.
  - 3. 14/2 AWG from the DC power supply to each remote.
  - 4. Grounding per NEC and TIA standards.
  - 5. Coordinate Alarm and Monitoring points with the Fire Alarm contractor.

**3.4 EXAMINATION**

- A. The contractor must examine areas and conditions under which ERCES components are to be installed and notify the Owner's representative, in writing of those conditions which



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are, in the Contractor's opinion, potentially detrimental to proper completion of the work. The Contractor shall not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Owner.

- B. Examine pathway elements intended for cable, check raceways, cable trays and other elements for compliance with space allocations, installations tolerances, hazards to cable installation, and other conditions affecting installation. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Specific items of examination shall include, but shall not necessarily be limited to, the following:
  - 1. Locations for all new ERCES antennas, cable and splitter equipment.
  - 2. Adequate space, power, and environment conditions to support installation.

**3.5 TESTING**

- A. Acceptance testing will be performed confirming the requirements have been met.
- B. The contractor shall complete the acceptance testing as prescribed in the approved Acceptance Test Plan (ATP) submittal. The ERCES shall be tested by a person or persons who are holders of a FCC General Radio Operator's License (GROL) or by the AHJ or their designees.
- C. Testing Procedure (PSN):
  - 1. Test Location:
    - a. Each floor of the building shall be divided into a grid of 20 approximately equal test areas. For large floor areas exceeding 128,000SF, follow guidelines prescribed in 2015 NFPA 5000, Annex F.3.9.3.
    - b. Downlink received signal level measurements will be recorded in the coverage area using a live signal or test tone from a signal generator injected into the BDA at the same level as the measured off air signal. Measurements will be collected using a spectrum analyzer and a dipole antenna.
    - c. Failure of a maximum of two nonadjacent test areas shall not result in failure of the test.
    - d. In the event that three of the test areas fail the test, in order to be more statistically accurate, the floor shall be divided into 40 equal test areas. Failure of a maximum of four nonadjacent test areas shall not result in failure of the test. If the system fails the 40-area test, the system shall be altered to meet the 90 percent coverage.
    - e. A test location approximately in the center of each test area shall be selected for the test. Once the location has been selected, the location shall represent the entire test area.



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2. Equipment Requirements:
  - a. Test equipment shall be allowed to stabilize in test environment prior to calibration for a minimum of thirty minutes. Any change in temperature can void the calibration.
  - b. Signal generator must be connected to the Head end downlink (TX) interface via tested and approved coaxial cabling and connectors.
  - c. Signal generator transmits frequency (MHz) and Power (dBm) must be preapproved by project engineer prior to testing. The control channel from the base station can be used as a signal source as well.
  - d. Verify that all remote units for the area under test are ON.
  - e. Test frequency/control channel and power must be recorded corresponding to the date and time of each site walk measurement.
  - f. Spectrum analyzer with unity gain (0dB, frequency specific) dipole receive antenna must be preapproved by the project engineer.
  - g. Site walk screen shots shall be saved with frequency span +/- 20 MHz relative to the center/measured frequency.
3. Documentation:
  - a. Exact location of measurement must be marked on the grid print.
  - b. Screen shots must be taken in all designated grid spaces. If more than one reading is saved per grid zone, saved results shall be distinguished from one another using Grid## "A", Grid## "B" etc.
  - c. Results of testing are reported to project engineer for analysis and reporting.
4. Proof of Performance and Testing Methodology:
  - a. Test requirements specified in this document shall be successfully completed prior to issuance of a Certificate of Occupancy and yearly thereafter. Also testing with a successful result shall occur whenever a design change is made to the system, which changes the technical performance or coverage of the system. All tests shall be coordinated 10 days in advance with the AHJ. Results of the test shall be reported in writing to the AHJ.

**3.6 TECHNICAL TRAINING**

- A. The Contractor shall be responsible for organizing a structured demonstration of acceptance tests to ensure organized and efficient testing.
- B. The Contractor shall provide written notice to the Owner's representative at least thirty (30) calendar days in advance of the initiation of final system acceptance testing.





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Included in the advance notice shall be three copies of the approved test plans and procedures to ensure acceptance test monitoring personnel are familiar with the tests, procedures and the expected results.

- C. It is the responsibility of the Contractor to notify the Owner's representative at appropriate times to permit visual inspections of all ERCES components. No Installation work shall be covered until a visual inspection has been completed.
- D. Provide the Owner's representative with the opportunity to witness all testing. On reasonable request and with ten working days' notice, the Contractor shall demonstrate that the test procedure competently identifies the parameter being demonstrated or the fault condition being tested.
- E. The Contractor shall provide a Certificate of Compliance signed by a responsible company representative after completion of the site installation. This document shall certify that each element of the installed system and wiring complies with the requirements of the Contract Documents and the certification shall be included with the final acceptance report.
- F. The Contractor shall provide training for elements of the ERCES. Such training shall include management, operational and maintenance levels and shall be provided to individuals (maximum of 3) to be designated by the Owner's representative.
- G. Training shall be conducted by qualified personnel fully conversant on the equipment, materials, software, and over all operation of the installed elements. Training shall be based upon as much hands-on training as is possible. The Contractor shall provide all necessary training aids and materials, which shall include written handouts.
- H. All training shall be completed prior to Final Acceptance.

**3.7 TRAINING**

- A. Retain the Systems Integrator to instruct the Owner/Owner's Maintenance Personnel on the proper operation of the system including alarms.
- B. Provide time for one training session for three hours.
- C. Refer to Division 01 Section for Demonstration and Training.

**END OF SECTION**

**SECTION 28 00 02  
ELECTRONIC SECURITY BASIC REQUIREMENTS**

**PART 1 - GENERAL**

**1.1 SECTION INCLUDES**

- A. Work included in 28 00 02, Electronic Security Basic Requirements applies to Division 28, Electronic Security work to provide materials, labor, tools, permits, incidentals, and other services to provide and make ready for Owner's use of electronic security systems for proposed project.
- B. Contract Documents include, but are not limited to, Specifications including Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Drawings, Addenda, Owner/Architect Agreement, and Owner/Contractor Agreement. Confirm requirements before commencement of work.
- C. Definitions:
  - 1. Provide: To furnish and install, complete and ready for intended use.
  - 2. Furnish: Supply and deliver to project site, ready for unpacking, assembly and installation.
  - 3. Install: Includes unloading, unpacking, assembling, erecting, installing, applying, finishing, protecting, cleaning and similar operations at project site as required to complete items of work furnished.
  - 4. Approved or Approved Equivalent: To possess the same performance qualities and characteristics and fulfill the utilitarian function without any decrease in quality, durability or longevity. For equipment/products defined by the Contractor as "equivalent," substitution requests must be submitted to Engineer for consideration, in accordance with Division 01, General Requirements, and approved by the Engineer prior to submitting bids for substituted items.
  - 5. Authority Having Jurisdiction (AHJ): Indicates reviewing authorities having jurisdiction, including local fire marshal, Owner's insurance underwriter, Owner's Authorized Representative, and other reviewing entity whose approval is required to obtain systems acceptance.

**1.2 RELATED SECTIONS**

- A. Contents of Section apply to Division 28, Electronic Security Contract Documents.
- B. Related Work:
  - 1. Additional conditions apply to this Division including, but not limited to:
    - a. Specifications including Division 00, Procurement and Contracting Requirements and Division 01, General Requirements.
    - b. Drawings



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- c. Addenda
  - d. Owner/Architect Agreement
  - e. Owner/Contractor Agreement
  - f. Codes, Standards, Public Ordinances and Permits
- C. Contents of Division 26, Electrical apply to this Section.
- D. Comply with related products/systems requirements for Internet Protocol Communication devices located in Division 27:
  - 1. Section 27 13 00, Communications Backbone Cabling.
  - 2. Section 27 15 00, Communications Horizontal Cabling.

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards per Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, individual Division 28, Electronic Security Sections and those listed in this Section.
- B. Codes to include latest adopted editions, including current amendments, supplements and local jurisdiction requirements in effect as of the date of the Contract Documents, of/from:
  - 1. State of California:
    - a. CBC - California Building Code
    - b. CEC - California Electrical Code
    - c. CEC T24 - California Energy Code Title 24
    - d. CFC - California Fire Code
    - e. CMC - California Mechanical Code
    - f. CPC - California Plumbing Code
    - g. CSFM - California State Fire Marshal
- C. Reference standards and guidelines include but are not limited to the latest adopted editions from:
  - 1. ABA - Architectural Barriers Act
  - 2. ADA - Americans with Disabilities Act
  - 3. ANSI - American National Standards Institute
  - 4. ASCE - American Society of Civil Engineers



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5. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers
  6. ASHRAE Guideline 0, the Commissioning Process
  7. ASME - American Society of Mechanical Engineers
  8. ASTM - ASTM International
  9. CFR - Code of Federal Regulations
  10. EPA - Environmental Protection Agency
  11. ETL - Electrical Testing Laboratories
  12. FM - FM Global
  13. ISO - International Organization for Standardization
  14. NEC - National Electric Code
  15. NEMA - National Electrical Manufacturers Association
  16. NFPA - National Fire Protection Association
  17. OSHA - Occupational Safety and Health Administration
  18. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association
  19. UL - Underwriters Laboratories Inc.
- D. See Division 28, Electronic Security individual Sections for additional references.

**1.4 SUBMITTALS**

- A. See Division 01, General Requirements for Submittal Procedures.
- B. Provide drawings in format and software release equal to the design documents. Drawings to be the same sheet size and scale as the Contract Documents.
- C. Provide drawings in format and software release equal to the design documents. Drawings to be the same sheet size and scale as the Contract Documents.
- D. In addition:
  1. "No Exception Taken" constitutes that review is for general conformance with the design concept expressed in the Contract Documents for the limited purpose of checking for conformance with information given. Any action is subject to the requirements of the Contract Documents. Contractor is responsible for the dimensions and quantity and will confirm and correlate at the job site, fabrication processes and techniques of construction, coordination of the work with that of all other trades, and the satisfactory performance of the work.



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2. Provide product submittals and shop drawings in electronic format only. Electronic format must be submitted via zip file via e-mail. For electronic format, provide one file per division containing one bookmarked PDF file with each bookmark corresponding to each Specification Section. Arrange bookmarks in ascending order of Specification Section number. Individual submittals sent piecemeal in a per Specification Section method will be returned without review or comment. Copy Architect on all transmissions/submissions.
3. Product Data: Provide manufacturer's descriptive literature for products specified in Division 28, Electronic Security Sections.
4. Identify/mark each submittal in detail. Note what difference, if any, exist between the submitted item and the specified item. Failure to identify the differences will be considered cause for disapproval. If differences are not identified and/or not discovered during the submittal review process, Contractor remains responsible for providing equipment and materials that meet the specifications and drawings.
  - a. Label submittal to match numbering/references as shown in Contract Documents. Highlight and label applicable information to individual equipment or cross out/remove extraneous data not applicable to submitted model. Clearly note options and accessories to be provided, including field installed items. Highlight connections by/to other trades.
  - b. Include technical data, installation instructions and dimensioned drawings for products, equipment and devices installed, furnished or provided. Reference individual Division 28, Electronic Security specification Sections for specific items required in product data submittal outside of these requirements.
  - c. See Division 28, Electronic Security individual Sections for additional submittal requirements outside of these requirements.
5. Maximum of two reviews of complete submittal package. Arrange for additional reviews and/or early review of long-lead items; Bear costs of additional reviews at Engineer's hourly rates. Incomplete submittal packages/submittals will be returned to contractor without review.
6. Resubmission Requirements: Make corrections or changes in submittals as required, and in consideration of Engineer's comments. Identify Engineer's comments and provide an individual response to each of the Engineer's comments. Cloud changes in the submittals and further identify changes which are in response to Engineer's comments.
7. Structural/Seismic: Provide weights, dimensions, mounting requirements and like information required for mounting, seismic bracing, and support. Indicate manufacturer's installation and support requirements to meet ASCE 7-16 requirements for non-structural components. Provide engineered seismic drawings and equipment seismic certification. Equipment Importance Factor as specified in Division 01 and in Structural documents.
8. Trade Coordination: Include physical characteristics, electrical characteristics, device layout plans, wiring diagrams, and connections as required per Division 28, Electronic Security Coordination Documents. For equipment with electrical



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connections, furnish copy of approved submittal for inclusion in Division 26, Electrical and Division 28, Electronic Security submittals.

9. Make provisions for openings in building for admittance of equipment prior to start of construction or ordering of equipment.
10. Substitutions and Variation from Basis of Design:
  - a. The Basis of Design designated product establishes the qualities and characteristics for the evaluation of any comparable products by other listed acceptable manufacturers if included in this Specification or included in an approved Substitution Request as judged by the Design Professional.
  - b. If substitutions and/or equivalent equipment/products are being proposed, it is the responsibility of parties concerned, involved in, and furnishing the substitute and/or equivalent equipment to verify and compare the characteristics and requirements of that furnished to that specified and/or shown. If greater capacity and/or more materials and/or more labor are required for the rough-in, circuitry or connections than for the item specified and provided for, then provide compensation for additional charges required for the proper rough-in, circuitry and connections for the equipment being furnished. No additional charges above the Base Bid, including resulting charges for work performed under other Divisions, will be allowed for such revisions. Coordinate with the requirements of "Submittals." For any product marked "or approved equivalent," a substitution request must be submitted to Engineer for approval prior to purchase, delivery or installation.
  - c. Where manufacturer equipment or model numbers are indicated with no exceptions, substitutions will be rejected.
11. Shop Drawings: Provide coordinated shop drawings which include physical characteristics of all systems, device layout plans, and control wiring diagrams. Reference individual Division 28, Electronic Security specification Sections for additional requirements for shop drawings outside of these requirements.
  - a. Provide Shop Drawings indicating access panel locations, size and elevation for approval prior to installation.
12. Samples: Provide samples when requested by individual Sections.
13. Resubmission Requirements:
  - a. Make any corrections or change in submittals when required by Architect/Engineer review comments. Provide submittals as specified. The engineer will not be required to edit and/or interpret the Contractor's submittals. Indicate changes for the resubmittal in a cover letter with reference to page(s) changed and reference response to comment. Cloud changes in the submittals.
    - 1) Resubmit for review until review indicates no exception taken or "make corrections noted."



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- 2) When submitting drawings for Engineers re-review, clearly indicate changes on drawings and "cloud" any revisions. Submit a list describing each change.
14. Operation and Maintenance Manuals, Owner's Instructions:
- a. Reference individual Division 28, Electronic Security Specification Sections for additional requirements for operations and maintenance manuals.
  - b. Submit, at one time, electronic files (PDF format) of manufacturer's operation and maintenance instruction manuals and parts lists for equipment or items requiring servicing. Submit data when work is substantially complete and in same order format as submittals. Include name and location of source parts and service for each piece of equipment.
    - 1) Include copy of approved submittal data along with submittal review letters received from Engineer. Data to clearly indicate installed equipment model numbers. Delete or cross out data pertaining to other equipment not specific to this project.
    - 2) Include copy of manufacturer's standard Operations and Maintenance for equipment. At front of each tab, provide routine maintenance documentation for scheduled equipment. Include manufacturer's recommended maintenance schedule and highlight maintenance required to maintain warranty. Furnish list of routine maintenance parts, including part numbers, sizes and quantities relevant to each piece of equipment.
    - 3) Include copy of complete parts list for equipment. Include available exploded views of assemblies and sub-assemblies.
    - 4) Include Warranty per Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 28 00 02, Electronic Security Basic Requirements and individual Sections.
    - 5) Include product certificates of warranties and guarantees.
    - 6) Include copy of start-up and test reports specific to each piece of equipment.
    - 7) Include commissioning reports.
    - 8) Engineer will return incomplete documentation without review.
    - 9) Engineer will provide one set of review comments in Submittal Review format. Arrange for additional reviews; Bear costs for additional reviews at Engineer's hourly rates.
  - c. Thoroughly instruct Owner in proper operation of equipment and systems. Where noted in individual Sections, training will include



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classroom instruction with applicable training aids and systems demonstrations. Field instruction per Section 28 00 02, Electronic Security Basic Requirements Article titled "Demonstration."

- d. Copies of certificates of code authority inspections, acceptance, code required acceptance tests, letter of conformance and other special guarantees, certificates of warranties, specified elsewhere or indicated on Drawings.

#### 15. Record Drawings:

- a. Maintain at site at least one set of drawings for recording "as-constructed" conditions. Indicate on drawings changes to original documents by referencing revision document, and include buried elements and location of concealed items. Include items changed by addenda, field orders, supplemental instructions, and constructed conditions.
- b. Record Drawings are to include equipment locations, calculations, and schedules that accurately reflect "as constructed or installed" for project.
- c. At completion of project, input changes to original project on CAD Drawings and make one set of black-line drawings created from CAD Files in version/release equal to contract drawings. Submit CAD Files and drawings upon substantial completion.
- d. See Division 28, Electronic Security individual Sections for additional items to include in Record Drawings.

### 1.5 QUALITY ASSURANCE

- A. Regulatory Requirements: Work and materials installed to conform with all local, State and Federal codes, and other applicable laws and regulations. Where code requirements are at variance with Contract Documents, meet code requirements as a minimum requirement and include costs necessary to meet these in Contract. Machinery and equipment are to comply with OSHA requirements, as currently revised and interpreted for equipment manufacturer requirements. Install equipment provided per manufacturer recommendations.
- B. Whenever this Specification calls for material, workmanship, arrangement or construction of higher quality and/or capacity than that required by governing codes, higher quality and/or capacity take precedence.
- C. Drawings are intended to be diagrammatic and reflect the Basis of Design manufacturer's equipment. They are not intended to show every item in its exact dimensions, or details of equipment or proposed systems layout. Verify actual dimensions of systems (e.g. cable tray, panels, etc.) and equipment proposed to assure that systems and equipment will fit in available space. Contractor is responsible for design and construction costs incurred for equipment other than Basis of Design, including, but not limited to, architectural, structural, electrical, HVAC, fire sprinkler, and plumbing systems.





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- D. Manufacturer's Instructions: Follow manufacturer's written instructions. If in conflict with Contract Documents, obtain clarification. Notify Engineer/Architect, in writing, before starting work.
- E. Items shown on Drawings are not necessarily included in Specifications or vice versa. Confirm requirements in all Contract Documents.
- F. Provide products that are UL listed.

**1.6 WARRANTY**

- A. Provide written warranty covering the work for a period of one year from date of Substantial Completion in accordance with Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 28 00 02, Electronic Security Basic Requirements and individual Division 28, Electronic Security Sections.
- B. Sections under this Division can require additional and/or extended warranties that apply beyond basic warranty under Division 01, General Requirements and the General Conditions. Confirm requirements in all Contract Documents.

**1.7 COORDINATION DOCUMENTS**

- A. Prior to construction, prepare and submit coordinated layout drawings (composite drawings), to coordinate installation and location of ductwork, grilles, diffusers, piping, fire sprinklers, plumbing, lights, and electrical services. Composite Drawings show services on single sheet. Key Drawings to structural column identification system. Prior to completion of Drawings, coordinate proposed installation with architectural and structural requirements, and other trades (including plumbing, HVAC, fire protection, electrical, ceiling suspension, and ceiling tile systems, etc.), and provide maintenance access requirements. Coordinate with submitted architectural systems (i.e. roofing, ceiling, finishes) and structural systems as submitted, including footings and foundation. Identify zone of influence from footings and ensure systems are not routed within the zone of influence.
- B. Prepare Drawings as follows:
  - 1. Drawings in CAD Format. CAD format release equal to design documents. Drawings to be same sheet size and scale as Contract Drawings and indicate location, size and elevation above finished floor of equipment and distribution systems.
  - 2. Review and revise, as necessary, section cuts in Contract Drawings after verification of field conditions.
  - 3. Indicate fittings, hangers, access panels, and elevation of bottom of cable tray above finished floor.
  - 4. Drawings to indicate proposed ceiling grid and lighting layout as shown on electrical drawings and architectural reflected ceiling drawings and HVAC equipment, ductwork.
  - 5. Incorporate Addenda items and change orders.



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6. Provide additional coordination as requested by other trades.
- C. Advise Architect in event conflict occurs in location or connection of equipment. Bear costs resulting from failure to properly coordinate installation or failure to advise Architect of conflict.
- D. Submit final Coordination Drawings with changes as Record Drawings at completion of project.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Articles, fixtures, and equipment of a kind to be standard product of one manufacturer, including but not limited to panels, devices and equipment unless otherwise specified in individual Division 28, Electronic Security Sections.

**2.2 STANDARDS OF MATERIALS AND WORKMANSHIP**

- A. Base contract upon furnishing materials as specified. Materials, equipment, and fixtures used for construction are to be new, latest products as listed in manufacturer's printed catalog data and are to be UL, ETL, or FM listed and labeled or be approved by State, County, and City authorities prior to procurement and installation.
- B. Names and manufacturer's names denote character and quality of equipment desired and are not to be construed as limiting competition.
- C. Hazardous Materials:
  1. Comply with local, State of California, and Federal regulations relating to hazardous materials.
  2. Comply with Division 00, Procurement and Contracting Requirements and Division 01, General Requirements for this project relating to hazardous materials.
  3. Do not use any materials containing a hazardous substance. If hazardous materials are encountered, do not disturb; immediately notify Owner and Architect. Hazardous materials will be removed by Owner under separate contract.

**PART 3 - EXECUTION**

**3.1 ACCESSIBILITY AND INSTALLATION**

- A. Confirm Accessibility and Installation requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 28 00 02, Electronic Security Basic Requirements and individual Division 28, Electronic Security Sections.
- B. Install equipment having components requiring access (i.e., devices, equipment, electrical boxes, panels, etc.) so that they may be serviced, reset, replaced or recalibrated by service people with normal service tools and equipment. Do not install



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equipment in obvious passageways, doorways, scuttles or crawlspaces which would impede or block intended usage.

- C. Install equipment and products complete as directed by manufacturer's installation instructions. Obtain installation instructions from manufacturer prior to rough-in of equipment and examine instructions thoroughly. When requirements of installation instructions conflict with Contract Documents, request clarification from Architect prior to proceeding with installation. This includes proper installation methods, sequencing and coordination with other trades and disciplines.
- D. Earthwork:
  - 1. Confirm Earthwork requirements in Contract Documents. In absence of specific requirements, comply with individual Division 28, Electronic Security Sections and the following:
    - a. Perform excavation, dewatering, shoring, bedding, and backfill required for installation of work in this Division in accordance with related earthwork divisions. Contact utilities and locate existing utilities prior to excavation. Repair any work damaged during excavation or backfilling.
    - b. Excavation: Do not excavate under footings, foundation bases, or retaining walls.
    - c. Provide protection of underground systems. Review the project Geotechnical Report for references to corrosive or deleterious soils which will reduce the performance or service life of underground systems materials.
- E. Firestopping:
  - 1. Confirm Firestopping requirements in Division 07, Thermal and Moisture Protection. In absence of specific requirements, comply with individual Division 28, Electronic Security Sections and the following:
    - a. Coordinate location and protection level of fire and/or smoke rated walls, ceilings, and floors. When these assemblies are penetrated, seal around conduit, raceway and equipment with approved firestopping material. Install firestopping material complete as directed by manufacturer's installation instructions. Meet requirements of ASTM E814, Standard Test Method for Fire Tests of Through-Penetration Fire Stops.
- F. Plenums:
  - 1. In plenums, provide plenum rated materials that meet the requirements to be installed in plenums.

### 3.2 SEISMIC CONTROL

- A. Confirm Seismic Control requirements in Division 01, General Requirements, Structural documents, and individual Division 28 Electronic Security Sections.
- B. General:

1. Earthquake resistant designs for Electronic Security (Division 28) equipment to conform to regulations of jurisdiction having authority.
2. Restraints which are used to prevent disruption of function of piece of equipment because of application of horizontal force to be such that forces are carried to frame of structure in such a way that frame will not be deflected when apparatus is attached to a mounting base and equipment pad, or to structure in normal way, utilizing attachments provided. Secure equipment and distribution systems to withstand a force in direction equal to value defined by jurisdiction having authority.
3. Provide means to prohibit excessive motion of security equipment during earthquake.

### **3.3 REVIEW AND OBSERVATION**

- A. Confirm Review and Observation requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 28 00 02, Electronic Security Basic Requirements and individual Division 28, Electronic Security Sections.
- B. Notify Architect, in writing, at following stages of construction so that they may, at their option, visit site for review and construction observation:
  1. Underground conduit and wire installation prior to backfilling.
  2. Prior to covering walls when electronic security system installation is started.
  3. Prior to ceiling cover/installation.
  4. When main systems, or portions of, are being tested and ready for inspection by AHJ.
- C. Final Punch: Costs incurred by additional trips required due to incomplete systems will be the responsibility of the Contractor.

### **3.4 CUTTING AND PATCHING**

- A. Confirm Cutting and Patching Requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with individual Division 28, Electronic Security Sections and the following:
  1. Proposed floor cutting/core drilling/sleeve locations to be approved by Project Structural Engineer. Submit proposed locations to Architect/Project Structural Engineer. Where slabs are of post tension construction, perform x-ray scan of proposed penetration locations and submit scan results including proposed penetration locations to Project Structural Engineer/Architect for approval. Where slabs are of waffle type construction, show column cap extent and cell locations relative to proposed penetration(s).
  2. Cutting, patching and repairing for work specified in this Division including plastering, masonry work, concrete work, carpentry work, and painting included



## **SECTION 28 00 02 ELECTRONIC SECURITY BASIC REQUIREMENTS**

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under this Section will be performed by skilled craftsmen of each respective trade in conformance with appropriate Division of Work.

3. Additional openings required in building construction to be made by drilling or cutting. Use of jack hammer is specifically prohibited. Patch openings in and through concrete and masonry with grout.
4. Restore new or existing work that is cut and/or damaged to original condition. Patch and repair specifically where existing items have been removed. This includes repairing and painting walls, ceilings, etc. where existing conduit and devices are removed as part of this project. Where alterations disturb lawns, paving, and walks, repair, refinish and leave in condition matching existing prior to commencement of work.
5. Additional work required by lack of proper coordination will be provided at no additional cost to the Owner.

### **3.5 EQUIPMENT SELECTION AND SERVICEABILITY**

- A. Replace or reposition equipment which is too large or located incorrectly to permit servicing, at no additional cost to Owner.

### **3.6 DELIVERY, STORAGE AND HANDLING**

- A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with the individual Division 28, Electronic Security Sections and the following:
  1. Handle materials delivered to project site with care to avoid damage. Store materials on site inside building or protected from weather, dirt and construction dust.
  2. Protect equipment and pipe to avoid damage. Close conduit openings with caps or plugs. Keep motors and bearings in watertight and dustproof covers during entire course of installation.
  3. Protect devices, panels and similar items until in service.
  4. Products and/or materials that become damaged due to water, dirt and/or dust as a result of improper storage to be replaced before installation.

### **3.7 DEMONSTRATION**

- A. Confirm Demonstration requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 28 00 02, Electronic Security Basic Requirements and individual Division 28, Electronic Security Sections.
- B. Upon completion of work and adjustment of equipment, test systems, demonstrate to Owner's Authorized Representative, Architect and Engineer that equipment furnished and installed or connected under provisions of these Specifications functions in manner required. Provide field instruction to Owner's Staff as specified in Division 01, General Requirements, Section 28 00 02, Electronic Security Basic Requirements and individual Division 28, Electronic Security Sections.



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- C. Manufacturer's Field Services: Furnish services of a qualified factory certified instructor at time approved by Owner, to instruct maintenance personnel, correct defects or deficiencies, and demonstrate to satisfaction of Owner that entire system is operating in satisfactory manner and complies with requirements of other trades that may be required to complete work. Complete instruction and demonstration prior to final job site observations.

### **3.8 CLEANING**

- A. Confirm cleaning requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 28 00 02, Electronic Security Basic Requirements and individual Division 28 Sections.
- B. Upon completion of installation, thoroughly clean exposed portions of equipment, removing temporary labels and traces of foreign substances. Throughout work, remove construction debris and surplus materials accumulated during work.

### **3.9 INSTALLATION**

- A. Confirm Installation requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 28 00 02, Electronic Security Basic Requirements and individual Division 28, Electronic Security Sections.
- B. Install equipment in accordance with manufacturer's installation instructions, plumb and level and firmly anchored to building structure. Maintain manufacturer's recommended clearances.
- C. Start up equipment, in accordance with manufacturer's start-up instructions, and in presence of manufacturer's representative. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.
- D. Provide miscellaneous supports required for installation of equipment, conduit and wiring.

### **3.10 PAINTING**

- A. Confirm Painting requirements in Division 01, General Requirements and Division 09, Finishes. In absence of specific requirements, comply with individual Division 28, Electronic Security Sections and the following:
  - 1. Ferrous Metal: After completion of work, thoroughly clean and paint exposed supports constructed of ferrous metal surfaces, i.e. hangers, hanger rods, equipment stands, with one coat of black asphalt varnish for exterior or black enamel for interior suitable for hot surfaces.
  - 2. In electrical and mechanical room, on roof or other exposed areas, equipment not painted with enamel to receive two coats of primer and one coat of rustproof enamel, colors as selected by Architect.
  - 3. See individual equipment Specifications for other painting.
  - 4. Structural Steel: Repair damage to structural steel finishes or finishes of other materials damaged by cutting, welding or patching to match original.



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5. Conduit: Clean, primer coat and paint interior conduit exposed in finished areas with two coats paint suitable for metallic surfaces. Color selected by Architect.

#### **3.11 ACCEPTANCE**

- A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with individual Division 28, Electronic Security Sections and the following:
  1. System cannot be considered for acceptance until work is completed and demonstrated to Architect that installation is in strict compliance with Specifications, Drawings and manufacturer's installation instructions, particularly in reference to following:
    - a. Cleaning
    - b. Operation and Maintenance Manuals
    - c. Training of Operating Personnel
    - d. Record Drawings
    - e. Warranty and Guaranty Certificates
    - f. Start-up/Test Documents and Commissioning Reports

#### **3.12 FIELD QUALITY CONTROL**

- A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with individual Division 28, Electronic Security Sections and the following:
  1. Tests:
    - a. Conduct tests of equipment and systems to demonstrate compliance with requirements specified. Reference individual Specification Sections for required tests. Document tests and include in Closeout Documents.
    - b. During site evaluations by Architect or Engineer, provide appropriate personnel with tools to remove and replace trims, covers, and devices so that proper evaluation of installation can be performed.

#### **3.13 LETTER OF CONFORMANCE**

- A. Provide Letter of Conformance, copies of manufacturers' warranties and extended warranties with a statement in the letter that electronic security systems were installed in accordance with manufacturer's recommendations, UL listings and FM Global approvals. Include Letter of Conformance, copies of manufacturers' warranties and extended warranties in operating and maintenance manuals.

**END OF SECTION**

**SECTION 28 10 00**  
**ACCESS CONTROL AND INTRUSION DETECTION**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Work included:
1. Security Management System (SMS)
  2. Access Control System Main Control Panel
  3. Access Control System Door Control Panel
  4. Card Reader
  5. Access Control Cards
  6. Biometric Reader
  7. Door Position Switch/Contact
  8. Request to Exit Device (REX)
  9. Electric Latch or Strike (provided by others - see door hardware schedule)
  10. Magnetic Lock (provided by others - see door hardware schedule)
  11. Power Supply
  12. Intrusion Main Control Panel
  13. Motion Detector
  14. Keypad
  15. Glass Break Detector
  16. Seismic Sensor/Shock Detector
  17. Cable and Wire
  18. Lockdown/Panic Button
  19. Door Entry Video Intercom System

**1.2 RELATED SECTIONS**

- A. Contents of Division 28, Electronic Safety and Security and Division 01, General Requirements apply to this Section.





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#### **1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Division 28, Electronic Safety and Security and Division 01, General Requirements.
- B. In addition, meet the following:
  - 1. Federal Information Processing Standard Publication 201-1, Personal Identity Verification (PIV) of Federal Employees and Contractors. (FIPS 201-1)
  - 2. Homeland Security Presidential Standard Directive 12: Policy for a Common Identification Standard for Federal Employees and Contractors. (HSPD-12)

#### **1.4 SUBMITTALS**

- A. Submittals as required by Division 28, Electronic Safety and Security and Division 01, General Requirements.

#### **1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Division 28, Electronic Safety and Security and Division 01, General Requirements.

#### **1.6 WARRANTY**

- A. Warranty of materials and workmanship as required by Division 28, Electronic Safety and Security and Division 01, General Requirements.

### **PART 2 - PRODUCTS**

#### **2.1 MANUFACTURERS**

- A. Security Management System (SMS):
  - 1. Honeywell
  - 2. AMAG
  - 3. LenelS2
  - 4. Or approved equivalent.
- B. Access Control System Main Control Panel:
  - 1. Honeywell
  - 2. AMAG
  - 3. LenelS2
  - 4. Or approved equivalent.



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- C. Access Control System Door Control Panel:
  - 1. Honeywell
  - 2. AMAG
  - 3. LenelS2
  - 4. Or approved equivalent.
- D. Card Reader:
  - 1. HID
  - 2. Or approved equivalent.
- E. Access Control Cards:
  - 1. HID
  - 2. Or approved equivalent.
- F. Biometric Reader:
  - 1. HID
  - 2. Or approved equivalent.
- G. Door Position Switch/Contact:
  - 1. Sentrol
  - 2. Or approved equivalent.
- H. Request to Exit Device (REX):
  - 1. Bosch
  - 2. Or approved equivalent.
- I. Electric Latch or Strike: Provided by others; see door hardware schedule.
- J. Magnetic Lock: Provided by others; see door hardware schedule.
- K. Power Supply:
  - 1. Altronix
  - 2. Or approved equivalent.
- L. Intrusion Main Control Panel:



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1. Honeywell
  2. Bosch
  3. Or approved equivalent.
- M. Motion Detector:
1. Honeywell
  2. Bosch
  3. Or approved equivalent.
- N. Keypad:
1. Bosch
  2. Honeywell
  3. Or approved equivalent.
- O. Glass Break Detector:
1. Honeywell
  2. Bosch
  3. Or approved equivalent.
- P. Seismic Sensor/Shock Detector:
1. Honeywell
  2. Bosch
  3. Or approved equivalent.
- Q. Cable and Wire:
1. West Penn Wire
  2. Or approved equivalent.
- R. Lockdown/Panic Button:
1. STI
  2. Or approved equivalent.
- S. Door Entry Video Intercom System:



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1. Video Door Entry Station with Card Reader:
  - a. Aiphone, Model AX-DVF.
  - b. Or approved equivalent.
2. Video Door Entry Station:
  - a. Aiphone, Model AX-DV.
  - b. Axis A8004-VE (use with A9801 Security Relay).
  - c. Or approved equivalent.
3. Master Station:
  - a. Aiphone, Model AX-8MV.
  - b. Or approved equivalent.
4. Central Exchange Unit (CEU):
  - a. Aiphone, Model AX-084C.
  - b. Or approved equivalent.

**2.2 SECURITY MANAGEMENT SYSTEM (SMS)**

- A. Furnish and install the Following:
  1. An SMS that is capable of controlling and monitoring the access control system and the intrusion alarm system and that has an interconnection with the video surveillance system.
  2. An SMS that is designed to control and/or interface with industry standard OEM equipment.
  3. An SMS that uses modular architecture to allow easy integration of the following capabilities/equipment:
    - a. Access Control
    - b. Intrusion detection
    - c. Elevator control.
    - d. Time and attendance.
    - e. CCTV system integration.
    - f. Alarm receiver interface.



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- g. Badging capabilities.
- h. Employee and visitor database.
- 4. Provide one server license and four client licenses.
- 5. All SMS software to reside within the controller and be through a standard web browser.
- 6. Up to 25 users to able to operate, monitor and control the entire system with a user ID and password.
- 7. Software will have the following:
  - a. User rights setup and password assignment.
  - b. Centralized access control and alarm transactions monitoring.
  - c. Remote control functions for access control, arming/disarming of alarm points and on/off controls.
  - d. Card database administration.
  - e. Report generation of transactions.

**2.3 ACCESS CONTROL SYSTEM MAIN CONTROL PANEL**

- A. Furnish and install the Following:
  - 1. A main access control system control panel that has the overall system intelligence, any required additional input/output boards and the communications controllers required for remote monitoring and control.
  - 2. An access control system main panel that is modular and can have optional systems and functionality added per project requirements.
  - 3. Control Panel Requirements:
    - a. 32-bits CPU.
    - b. Minimum speed of 500MHZ.
    - c. Must support standard RS 232, Ethernet and remote dial in via modem.
    - d. Minimum 512Mb of flash memory.
    - e. Minimum 512Mb of RAM.
    - f. Supports up to 64 channels for alarm monitoring and 64 channels of voltage free relays for alarm signaling.

- g. The TO consist of at least one CPU board, two card readers, controller board, one eight channel input and output board, AC line filter, regulated power supply unit with online battery charger.
- h. Control panel board to support four industry standard Wiegand compatible reader interface ports, provide digital input interfaces to door status sensors and form-C relay output interfaces to door strikes.

#### **2.4 ACCESS CONTROL SYSTEM DOOR CONTROL PANEL**

- A. The local door controller to consist of a scalable architecture, allowing the monitoring and control of single or multiple doors per controller.
- B. Door controller to utilize on-board microprocessors and database storage to allow for off-network door control capabilities.
- C. Door controller to be connected and managed through Ethernet, RS-232, RS-485 or wireless communications.
- D. Door controller is to match the brand manufacturer of the main access control panel and operate in conjunction with that system.

#### **2.5 CARD READER**

- A. Furnish and install card readers at locations indicated on the Drawings. Mounting height to be 48-inches unless noted otherwise on the Drawings.
- B. Furnish and install a single gang size, wall mount proximity card reader or mullion mount card reader on store front applications.
- C. Card Readers to be suitable for indoor or outdoor use.
- D. Card Readers to be ADA compliant.

#### **2.6 ACCESS CONTROL CARDS**

- A. 13.56 MHz Proximity Cards.

#### **2.7 BIOMETRIC READER**

- A. Furnish and install biometric readers based on the physiological characteristics of the building occupants.
- B. Install at locations indicated on drawings.
- C. Biometric readers to be ADA compliant.

#### **2.8 DOOR POSITION SWITCH/CONTACT**

- A. Furnish and install recessed door position switches designed to be compatible with and operate with the access control and intrusion system, in the locations indicated on the Drawings.



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- B. In situations where a recessed switch cannot be used, utilize a surface mount switch (roll-up door).
- C. Coordinate switch type and installation with architectural door hardware schedule and requirements.

**2.9 REQUEST TO EXIT DEVICE (REX)**

- A. Furnish and install a REX at each door indicated on the Drawings.
- B. Coordinate with the door hardware schedule for type of device required.
- C. If the REX is not built into the door hardware, install a surface mount passive infrared sensor (PIR) type device per architect's direction.

**2.10 ELECTRIC LATCH OR STRIKE**

- A. Provided by others; see door hardware schedule.

**2.11 MAGNETIC LOCK**

- A. Provided by others; see door hardware schedule.

**2.12 POWER SUPPLY**

- A. Furnish and install power supplies for the access control panels, intrusions panels and other system devices that has an integral battery for backup.
- B. Power supply converts 115VAC/60Hz input into eight independently controlled 12VDC or 24VDC fail safe and/or fail secure outputs with a total of 6 amp continuous supply current. Power supply has built in charger for backup batteries.
- C. Back up battery is 12V, 0.7 amp rechargeable, sealed and maintenance free with a two hour run time.
- D. Size power supply(s) so there is 20 percent spare capacity for future devices.
- E. Install in a UL listed enclosure.

**2.13 INTRUSION MAIN CONTROL PANEL**

- A. Furnish and install an intrusion main control panel concurrent with the access control installation, locate with the other security system components.
- B. The Main Panel Includes:
  - 1. Up to 255 events.
  - 2. 50 user passcodes.
  - 3. 43 programmable outputs.



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4. 48 points.
  5. On board Ethernet port for alarm communication and remote programming.
  6. On board USB for on-site programming.
  7. Email and text messaging notification for Android and iOS mobile devices.
  8. Programmable keypad shortcuts.
  9. Supports four keypads.
- C. Furnish and install Ethernet, telephone, or other submitted communications equipment for reporting and monitoring purposes.

**2.14 MOTION DETECTOR**

- A. Furnish and install motion detectors in the locations indicated on the Drawings.
- B. Furnish and install a ceiling mounted, 360 degree, dual-technology detector that is compatible with the intrusion alarm system.
- C. Motion Detector to be dual-technology, (microwave and PIR) with a 360-degree, 60-foot diameter coverage pattern, three sensitivity settings and visible LED lights to indicate a trouble condition.
- D. Motion Detector enclosure to be constructed of high impact ABS plastic.

**2.15 KEYPAD**

- A. Vacuum fluorescent display.
- B. Ten numeric keys and five function keys
- C. Audible tones for warning with adjustable volume. Tones include intrusion signal, entrance warning, exit warning, invalid key, trouble and keypad encoding.

**2.16 GLASS BREAK DETECTOR**

- A. Furnish and install glass break detectors in the locations indicated on the Drawings.
- B. Install a glass break detector that is compatible with the intrusion alarm system.

**2.17 SEISMIC SENSOR/SHOCK DETECTOR**

- A. Furnish and install seismic sensor/shock detectors in the locations indicated on the Drawings.
- B. Furnish and install a seismic sensor/shock detector that is compatible with the intrusion alarm system.





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**2.18 CABLE AND WIRE**

**A. Copper:**

1. Power: 18 AWG, 2 pair, unshielded twisted pair.
2. RS-232: 18 AWG, 4 conductor, shielded.
3. Category 6A cabling to match that installed by the telecom contractor in Division 27, Communications.
4. Indicate all other wire required by manufacturer installation instructions on submittal Drawings and diagrams.
5. All cabling to be plenum rated where required.

**B. Connectors:**

1. Modular connector.
2. 24 V Power: Screw-down on spade lug.

**2.19 LOCKDOWN/PANIC BUTTON**

- A. Push button with turn to reset.
- B. Custom labeling for LOCKDOWN.
- C. Clear cover to prevent accidental activation.

**2.20 DOOR ENTRY VIDEO INTERCOM SYSTEM**

- A. Provide a complete system which integrates with the SMS, with all components sourced from a single manufacturer.
- B. Video Door Entry Station:
1. Vandal-resistant, flush-mount, stainless steel faceplate.
  2. Integral intercom call-button, microphone and speaker.
  3. Integral color video camera with protective lens cover.
  4. Power and communication signal over single Cat6A cable connection to Central Exchange Unit.
- C. Master Station:
1. Door station selector buttons with LED indicator for up to eight doors.
  2. Selective door release, scan monitor, line transfer and intercom call buttons with LED indicators.



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3. Intercom microphone, speaker and volume controls.
  4. 3-1/2-inch color LCD screen.
  5. Communication signal over single Cat6A cable connection to Central Exchange Unit.
  6. Provide with desktop mount.
- D. Central Exchange Unit (CEU):
1. Capable of connecting to up to four master stations and eight door stations over Cat6A cable. Standard RJ45 type jacks.
  2. Local NTSC video outputs.
  3. Relay outputs for connection to SMS for door release.
  4. Power supplies to provide 24V power to remote door entry stations.
  5. RS-232C log/setting port.

**PART 3 - EXECUTION**

**3.1 GENERAL INSTALLATION REQUIREMENTS**

- A. This specification is to be used in conjunction with the Drawings. There may be circumstances where a device listed here is not present or required on the project Drawings.
- B. Contractor to coordinate conduit installation with the electrical contractor.
- C. Preparation:
  1. Order required parts and equipment upon notification of award of the work.
  2. Bench test equipment prior to delivery to the job site.
  3. Verify the availability of power where required. If a new source of power is required, a licensed electrician is required to install it.
  4. Arrange to obtain programming information including access times, free access times, door groups, operator levels, etc.
- D. Carefully follow the instructions in the manufacturer's Installation Manual to ensure steps have been taken to provide a reliable, easy to operate system.
- E. Perform work as indicated in the Drawings and Specifications.
- F. Install 3/4-inch conduit to designated card readers, door contacts, request-to-exit devices and electric lock at each door.



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- G. Ensure minimum separation requirements are met between communications cables and power circuits.
- H. Integrate card readers with power assisted doors so that the door will not function without a valid card read while in secure mode.
- I. Double doors that are electronically controlled will unlock one leaf upon valid card read and unlock both leaves during programmed time to be unlocked.
- J. Execute adequate testing of the system to ensure proper operation.
- K. Training Requirements:
  - 1. Provide adequate training of the system users to ensure adequate understanding to prevent operating errors.
  - 2. Provide eight hours of training of operational instruction and two hours of maintenance instruction. Training seminars are to be hands-on instruction held at Owner's facility.
  - 3. Provide Owner with manufacturer's operating instructions.
  - 4. Provide factory trained representatives to instruct Owner's personnel in the operation of system equipment.
  - 5. Provide Owner's Authorized Representative with training plan and training checklist two weeks before planned training according to manufacturer's instructions.
  - 6. Provide comprehensive training for Owner's Authorized Representative for operation, maintenance and troubleshooting of system. Attend training session and video tape by Commissioning Authority.
  - 7. Security contractor will fully explain and demonstrate operation, function and override of system including, but not limited to: Software operation, remote access, programming, priority levels and monitoring station.
- L. Workmanship:
  - 1. Comply with highest industry standards, except when specified requirements indicate more rigid standards or more precise workmanship.
  - 2. Perform work with persons experienced and qualified to produce workmanship specified.
  - 3. Maintain quality control over suppliers and Subcontractors.
- M. Equipment Pretest: Bench test prior to delivery to job site and prior to installation. Bench test per manufacturer's installation instructions.
- N. Fire-Rated Doors and Frames: Do nothing to modify a UL rated door or frame that would void the UL label or fire rating.



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- O. Grounding: Provide earth-grounding of equipment as required by equipment manufacturer. Earth ground to be connected to ground rod or approved cold water pipe. Do not use electrical or telephone ground connections as earth grounds. Do not use connections to mounting posts or building structural steel as earth grounds.
- P. Cutting and Patching: Responsible for cutting, fitting or patching that may be required to complete the work.

### **3.2 SECURITY MANAGEMENT SYSTEM (SMS)**

- A. Reference 3.01, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.
- C. Program per Owner's requirements.

### **3.3 ACCESS CONTROL SYSTEM MAIN CONTROL PANEL**

- A. Reference 3.01, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.

### **3.4 ACCESS CONTROL SYSTEM DOOR CONTROL PANEL**

- A. Reference 3.01, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.

### **3.5 CARD READER**

- A. Reference 3.01, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.

### **3.6 ACCESS CONTROL CARDS**

- A. Reference 3.01, General Installation Requirements.
- B. Provide 200 access control cards to the Owner. 100 cards are to be programmed per Owner requirements.

### **3.7 BIOMETRIC READER**

- A. Reference 3.01, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.

### **3.8 DOOR POSITION SWITCH/CONTACT**

- A. Reference 3.01, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.



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#### **3.9 REQUEST TO EXIT DEVICE (REX)**

- A. Reference 3.01, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.

#### **3.10 ELECTRIC LATCH OR STRIKE**

- A. Provided by others; see door hardware schedule.

#### **3.11 MAGNETIC LOCK**

- A. Provided by others; see door hardware schedule.

#### **3.12 POWER SUPPLY**

- A. Reference 3.01, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.
- C. Power to Security Equipment:
  - 1. Power equipment from 120 VAC circuit dedicated for security use, except as noted. Mark panel circuit breakers with labels worded "Security Equipment - Do Not Operate," or equivalent.
  - 2. Locate plug-in transformers at the security control panels. Secure low-voltage plug-in transformers to outlet with screw or strap. Clearly label transformers to identify purpose and use.
- D. Install power supplies for electric locks in central locations where they will not interfere with other operations.

#### **3.13 INTRUSION MAIN CONTROL PANEL**

- A. Reference 3.01, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.

#### **3.14 MOTION DETECTOR**

- A. Reference 3.01, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.

#### **3.15 KEYPAD**

- A. Reference 3.01, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.



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**3.16 GLASS BREAK DETECTOR**

- A. Reference 3.01, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.

**3.17 SEISMIC SENSOR/SHOCK DETECTOR**

- A. Reference 3.01, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.

**3.18 CABLE AND WIRE**

- A. Reference 3.01, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.
- C. Design, layout, size and plan new wire and cable runs as required.
- D. Wire and cable from the processors to devices at each door "home-run" unless otherwise specified.
- E. Wire and cable installed in conduit or surface metal raceway, except as follows: Wire or cable, in lengths of less than 10-feet, that is "fished" within walls, ceilings and door frames.
- F. Wire and cable passing through metalwork to be sleeved by an approved grommet or bushing.
- G. Avoid splicing conductors. Make splices in junction boxes (except at equipment). Make splices with an approved crimp connection. Do not use wire nuts on any low-voltage wiring.
- H. Identify wire and cable at terminations and at every junction box. Make identification with an approved permanent label, Brady or equal.
- I. Cable and Wire Terminations:
  - 1. Identify inputs and outputs on terminal strips with permanent marking labels.
  - 2. Neatly dress and tie all wiring. The length of conductors within enclosures to be sufficient to neatly train the conductor to the terminal point with no excess. Run wire and cable parallel or normal to walls, floors and ground.
  - 3. Install connectors as required by equipment manufacturers.
  - 4. Make terminations so that there is no bare conductor at the terminal. Conductor insulation to bear against the terminal or connector shoulder.



**SECTION 28 10 00  
ACCESS CONTROL AND  
INTRUSION DETECTION**

**DIVISION 28**

- 5. Do not obstruct equipment controls or indicators with wire or cable. Route wire and cable away from heat producing components such as resistors and regulators.
- J. Install the appropriate cable from the CPU to card readers, door contacts, request-to-exit devices and electric locks at each door.

**3.19 LOCKDOWN/PANIC BUTTON**

- A. Reference 3.01, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.
- C. Lockdown button to lock all exterior doors upon activation.
- D. Provide custom, non-removable label "LOCKDOWN".

**3.20 DOOR ENTRY VIDEO INTERCOM SYSTEM**

- A. Reference 3.01, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.

**END OF SECTION**

**SECTION 31 10 00  
SITE CLEARING**

**PART 1 – GENERAL**

**1.1 SUMMARY**

- A. This Section includes the following:
  - 1. Protecting existing trees, shrubs, groundcovers, plants, and grass to remain.
  - 2. Removing existing trees, shrubs, groundcovers, plants, and grass.
  - 3. Clearing and grubbing.
  - 4. Stripping and stockpiling topsoil.
  - 5. Removing above- and below-grade site improvements.
  - 6. Disconnecting, capping or sealing, removing site utilities, and abandoning site utilities in place.
  - 7. Temporary erosion and sedimentation control measures.

**1.2 MATERIAL OWNERSHIP**

- A. Except for stripped topsoil or other materials indicated to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

**1.3 PROJECT CONDITIONS**

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
  - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
  - 2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
- B. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.
- C. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.
- D. Do not commence site-clearing operations until temporary erosion and sedimentation control measures are in place.

**PART 2 – PRODUCTS (Not Applicable)**

**PART 3 – EXECUTION**





## **SECTION 31 10 00 SITE CLEARING**

### **DIVISION 31**

#### **3.1 PREPARATION**

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Locate and clearly flag trees and vegetation to remain or to be relocated.
- C. Protect existing site improvements to remain from damage during construction.
  - 1. Restore damaged improvements to their original condition, as acceptable to Owner.

#### **3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL**

- A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.
- B. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- C. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

#### **3.3 TREE PROTECTION**

- A. Erect and maintain temporary fencing around tree protection zones before starting site clearing. Remove fence when construction is complete.
- B. Do not excavate within tree protection zones, unless otherwise indicated.
- C. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by Architect.

#### **3.4 EXISTING UTILITIES**

- A. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed or abandoned in place.
  - 1. Arrange with utility companies to shut off indicated utilities.
- B. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
  - 1. Notify Architect not less than two days in advance of proposed utility interruptions.
  - 2. Do not proceed with utility interruptions without Architect's written permission.



## **SECTION 31 10 00 SITE CLEARING**

## **DIVISION 31**

### **3.5 CLEARING AND GRUBBING**

- A. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
  - 1. Place fill material in horizontal layers not exceeding a loose depth of [eight inches] and compact each layer to a density equal to adjacent original ground.

### **3.6 TOPSOIL STRIPPING**

- A. Remove sod and grass before stripping topsoil.
- B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.
- C. Stockpile topsoil away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

### **3.7 SITE IMPROVEMENTS**

- A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.

### **3.8 DISPOSAL**

- A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.
- B. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities.

**END OF SECTION**

**SECTION 31 20 00  
EARTH MOVING**

**PART 1 – GENERAL**

**1.1 SUMMARY**

- A. This Section includes the following:
1. Preparing subgrades for walks, pavements, lawns and grasses, and exterior plants.
  2. Excavating and backfilling for buildings and structures.
  3. Drainage course for slabs-on-grade.
  4. Base course for concrete walks and pavements.
  5. Base course for asphalt paving.
  6. Excavating and backfilling for utility trenches.

**1.2 QUALITY ASSURANCE**

- A. Standard Specifications: Comply with the Standard Specifications for Public Works Construction (SSPWC), latest edition and supplements for rock materials. The Standard Specifications apply only to performance and materials and how they are to be incorporated into the Work. The legal/contractual relationship sections and the measurement and payment sections do not apply to this document.

**1.3 REFERENCES**

- A. This specification section has been prepared using the Standard Specifications for Public Works Construction (Greenbook) as a reference.

**1.4 DEFINITIONS**

- A. Backfill: Soil material used to fill an excavation.
1. Type “B” Material: Backfill placed beside pipe in a trench, including haunches to support sides of pipe.
  2. Initial Backfill: Backfill placed over pipe in a trench.
  3. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Base Course: Course placed between the subgrade and hot-mix asphalt or concrete paving.
- C. Bedding Course: Course placed over the excavated subgrade in a trench before laying pipe.
- D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

- E. Classified Excavation: Removal and disposal of materials not defined as rock
- F. Drainage Course: Course supporting the slab-on-grade that also minimizes upward capillary flow of pore water.
- G. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
  - 1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions changes in the Work.
  - 2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.
- H. Fill: Soil materials used to raise existing grades.
- I. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- J. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below base, drainage fill, or topsoil materials.
- K. Unclassified Excavation: Removal and disposal of materials encountered regardless of nature of materials, including rock.
- L. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

## **1.5 PROJECT CONDITIONS**

- A. Examine site, Drawings, records of existing utilities and construction, record of test borings, and subsurface exploration report available from Owner. Records of test borings are for information only and are not guaranteed to represent all conditions that will be encountered.

## **1.6 PROTECTION**

- A. Soils Consultant: A geotechnical consultant shall advise on Construction techniques involved in work, including design, checking and approving of temporary bracing, sheeting, shoring, underpinning and other items pertinent to work, and encountered during prosecution of work. Consultant shall be primarily concerned with construction methods, which will prevent settlement or damage to surrounding structures, sidewalks, embankments, utilities and roads on Owner's property and adjoining properties
- B. Existing Utilities:
  - 1. Maintain existing utilities that are to remain in service. Before excavating over or adjacent to existing utilities, notify utility Owner to ensure protective work will be

coordinated and performed in accordance with utility Owner's requirements. If existing service lines, utilities and utility structures, which are to remain in service, are uncovered or encountered during these operations, safeguard and protect from damage.

2. Within limits of excavation, remove existing piping, subsoil drainage systems, conduit, manholes and relocated items, which are to be abandoned. Plug open ends of utilities to remain with concrete.
  3. Re-route existing subsoil drains which obstruct work around new constructions or incorporate them into new drainage systems.
  4. Consult Architect immediately for directions, should uncharted or incorrectly charted piping or other utilities be encountered during excavation. Cooperate with Owner and public and private utility companies in keeping their respective services, utilities and facilities in operation. If damaged, repair utilities to satisfaction of Architect and utility Owner.
- C. Existing Facilities: Protect and maintain in satisfactory manner, existing pavements, curbs, gutters, structures, conduits, fences, walls and other facilities to remain above and below grade. Restore facilities damaged by construction operations.
- D. Pumping and Draining: Excavate areas in such manner as to afford adequate drainage. Control grading in vicinity of excavated areas so ground surface will slope to prevent water running into excavated areas. Until work is completed, remove water from areas of construction that may interfere with proper performance of work or that may result in damage to the soil sub-grade and provide sumps, pumps, well points, electric power and attendance required for this purpose on a 24-hour basis if necessary. Protect construction from water during construction, including prevention of erosion of completed work during construction and until permanent drainage and erosion controls are operational. Repair adjoining properties, facilities and streets damaged due to improper protection.

## **PART 2 – PRODUCTS**

### **2.1 SOIL MATERIALS**

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: Sand, gravel, friable earth, or non-expansive clays, subject to Testing Laboratory's approval. Fill and backfill material shall be free of organic material, slag, cinders, expansive soils, trash or rubble and stones having maximum dimension greater than six inches.
- C. Unsatisfactory Soils: Expansive and other soils as defined in the project's geotechnical investigation report.
1. Unsatisfactory soils also include satisfactory soils not maintained within two percent of optimum moisture content at time of compaction.
- D. Base Course: Material conforming to SSPWC section 200-2.2, Crushed Aggregate Base or SSPWC section 200-2.4 Crushed Miscellaneous Base.

- E. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a one and one-half-inch sieve and not more than 12 percent passing a No. 200 sieve.
- F. Bedding Course:
  - 1. Flexible pipes: clean coarse sand.
  - 2. All other pipes: crushed rock conforming to subsection 200-1.2 and Table 200-1.2.1 (A) of the "Standard Specifications for Public Works Construction." For pipes up to and including 15 inches, maximum rock gradation shall be one-half inch. For pipes over 15 inches, maximum rock gradation shall be three-fourths inch.
- G. Drainage Course: Narrowly graded mixture of washed, crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a one and one-half-inch sieve and zero to five percent passing a No. 8 sieve.

## **2.2 ACCESSORIES**

- A. Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, six inches wide and four mils thick, continuously inscribed with a description of the utility. Color coding shall be according to the American Public Works Association (APWA) standards:
  - 1. Blue – Potable water and fire suppression lines.
  - 2. Green – Sanitary sewer and storm drain lines.
  - 3. Orange – Communication, alarm or signal lines.
  - 4. Purple – Reclaimed water, irrigation, and slurry lines.
  - 5. Red – Electrical power lines, cables, conduit and lighting lines.
  - 6. Yellow – Gas, oil, steam, petroleum, or gaseous material lines.

## **PART 3 – EXECUTION**

### **3.1 PREPARATION**

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- B. Preparation of subgrade for earthwork operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface is specified in Division 2 Section "Site Clearing" or "Demolition."
- C. Protect and maintain erosion and sedimentation controls, which are specified in Division 2 Section "Site Clearing" or "Demolition," during earthwork operations.

### **3.2 EXCAVATION**

- A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
  - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

### **3.3 EXCAVATION FOR STRUCTURES**

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus one inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
  - 1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.

### **3.4 EXCAVATION FOR WALKS AND PAVEMENTS**

- A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

### **3.5 EXCAVATION FOR UTILITY TRENCHES**

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
- B. Excavate trenches to uniform widths to provide six-inch clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit, unless otherwise indicated.
- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
  - 1. Excavate trenches six inches deeper than elevation required in rock or other unyielding bearing material, four inches deeper elsewhere, to allow for bedding course.

### **3.6 SUBGRADE INSPECTION**

- A. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
- B. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

### **3.7 UNAUTHORIZED EXCAVATION**

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2,500 pounds per square inch (psi), may be used when approved by Architect.
  - 1. Fill unauthorized excavations under other construction or utility pipe as directed by Architect.

### **3.8 STORAGE OF SOIL MATERIALS**

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
  - 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

### **3.9 UTILITY TRENCH BACKFILL**

- A. Place backfill on subgrades free of mud, frost, snow, or ice.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

#### **[NOTE TO ENGINEER: ITEMS C AND D REQUIRE VERIFICATION FOR APPLICABILITY]**

- C. Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Division 3 Section Cast-in-Place Concrete.
- D. Provide four-inch-thick, concrete-base slab support for piping or conduit less than 30 inches below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of four inches of concrete before backfilling or placing roadway base.
- E. Place and compact initial backfill of satisfactory soil, free of particles larger than one and a half inches in any dimension, to a height of 12 inches over the utility pipe or conduit.
  - 1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
- F. Place and compact final backfill of satisfactory soil to final subgrade elevation.
- G. Install warning tape directly above utilities, minimum six inches above top of pipe, minimum 12 inches below finished grade, except six inches below subgrade under pavements and slabs.

### **3.10 SOIL FILL**

- A. Plow, scarify, bench, or break up sloped surfaces steeper than one vertical to four horizontal so fill material will bond with existing material.



B. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use engineered fill.
3. Under steps and ramps, use engineered fill.
4. Under building slabs, use engineered fill.
5. Under footings and foundations, use engineered fill.

### 3.11 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within two percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace or scarify and air dry otherwise satisfactory soil material that exceeds optimum moisture content by two percent and is too wet to compact to specified dry unit weight.

### 3.12 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than **[eight inches]** in loose depth for material compacted by heavy compaction equipment, and not more than four inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:

1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material to 95 percent.
2. Under walkways, scarify and recompact top six inches below subgrade and compact each layer of backfill or fill soil material to 90 percent.
3. Under lawn or unpaved areas, scarify and recompact top six inches below subgrade and compact each layer of backfill or fill soil material to 85 percent.
4. For utility trenches, compact each layer of initial and final backfill soil material to 85 percent.

### 3.13 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

- B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
  - 1. Lawn or Unpaved Areas: Plus or minus one inch.
  - 2. Walks: Plus or minus one inch.
  - 3. Pavements: Plus or minus one-half inch.
- C. Grading inside Building Lines: Finish subgrade to a tolerance of one-half inch when tested with a 10-foot straightedge.

### **3.14 BASE COURSES**

- A. Place base course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place base course under pavements and walks as follows:
  - 1. Shape base course to required crown elevations and cross-slope grades.
  - 2. Compact base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

### **3.15 DRAINAGE COURSE**

- A. Place drainage course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:
  - 1. Place drainage course that exceeds six inches in compacted thickness in layers of equal thickness, with no compacted layer more than six inches thick or less than three inches thick.
  - 2. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

### **3.16 FIELD QUALITY CONTROL**

- A. Testing Agency: Owner will engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing.
- B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.
- C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.



## **SECTION 31 20 00 EARTH MOVING**

## **DIVISION 31**

- D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable.
- E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

### **3.17 PROTECTION**

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
  - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

### **3.18 DISPOSAL OF SURPLUS AND WASTE MATERIALS**

- A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

**END OF SECTION**

**SECTION 32 12 16  
HOT-MIX ASPHALT PAVING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This Section includes hot-mix asphalt paving, patching, and paving overlay.

**1.2 SUBMITTALS**

- A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.
- B. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.
- C. Material certificates.
- D. Log of placement of asphalt, including dates, times, temperature readings and other pertinent information.

**1.3 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Manufacturer shall be registered with and approved by authorities having jurisdiction or the DOT of the state in which Project is located.
- B. Standard Specifications: Comply with the Standard Specifications for Public Works Construction (SSPWC) and the California Department of Transportation (Caltrans), latest editions and supplements for asphalt paving work. These Specifications apply only to performance and materials and how they are to be incorporated into the Work. The legal/contractual relationship sections and the measurement and payment sections do not apply to this document.
- C. Asphalt-Paving Publication: Comply with AI MS-22, "Construction of Hot Mix Asphalt Pavements," unless more stringent requirements are indicated.

**1.4 PROJECT CONDITIONS**

- A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp or if the following conditions are not met:
  - 1. Tack Coat: Minimum surface temperature of 60 degrees Fahrenheit.
  - 2. Asphalt Base Course: Minimum surface temperature of 40 degrees Fahrenheit and rising at time of placement.



## **SECTION 32 12 16 HOT-MIX ASPHALT PAVING**

## **DIVISION 32**

3. Asphalt Surface Course: Minimum surface temperature of 60 degrees Fahrenheit at time of placement.
- B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 degrees Fahrenheit for oil-based materials, 50 degrees Fahrenheit for water-based materials, and not exceeding 95 degrees Fahrenheit.

### **PART 2 - PRODUCTS**

#### **2.1 AGGREGATES**

- A. Coarse and fine aggregate shall conform to SSPWC section 203-6.2.2. Mineral filler, if required, shall conform to SSPWC section 203-6.2.4.

#### **2.2 ASPHALT MATERIALS**

- A. Asphalt Binder: Paving asphalt, viscosity grade PG 64-10 conforming to Section 92 of the Caltrans Standard Specifications.
- B. Tack Coat: PG 64-10 conforming to Section 92 of the Caltrans Standard Specifications.
- C. Mixes: Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mix III-C3 PG 64-10 designed in conformance with SSPWC Section 203-6.5.

#### **2.3 AUXILIARY MATERIALS**

- A. Herbicide: Commercial chemical for weed control, registered by the EPA. Provide in granular, liquid, or wettable powder form.
- B. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with Caltrans Standard Specifications - Section 84 (Federal Specification No. TT-P-1952 for Blue, Red and Green paint; and State of California Standard Specification No. PTWB-01 for White, Yellow and Black paint) with drying time of less than 45 minutes.
  1. Color: As indicated.
- C. Wheel Stops: Precast, air-entrained concrete
  1. Dowels: Galvanized steel, one-half-inch diameter, 18-inch minimum length.

**PART 3 - EXECUTION**

**3.1 COLD MILLING**

- A. Clean existing pavement surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement by cold milling to grades and cross sections indicated.
  - 1. Mill to a depth of two inches.

**3.2 PATCHING**

- A. Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.
- B. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, hot-mix asphalt paving at a rate of 0.05 to 0.15 gallons/square yard.
- C. Patching: Fill excavated pavements with hot-mix asphalt base mix and, while still hot, compact flush with adjacent surface.

**3.3 SURFACE PREPARATION**

- A. Proof-roll subbase using heavy, pneumatic-tired rollers to locate areas that are unstable or that require further compaction.
- B. Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
  - 1. Sweep loose granular particles from surface of unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.
- C. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.
- D. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gallons/square yard.
  - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
  - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

**3.4 HOT-MIX ASPHALT PLACING**

- A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
  - 1. Spread mix at minimum temperature of 250 degrees Fahrenheit.
  - 2. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
- B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.
- C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

**3.5 COMPACTION**

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or vibratory-plate compactors in areas inaccessible to rollers.
  - 1. Complete compaction before mix temperature cools to 185 degrees Fahrenheit.
- B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.
- C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
  - 1. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent nor greater than 96 percent.
- D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.
- E. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- F. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

**3.6 INSTALLATION TOLERANCES**

- A. Thickness: Compact each course to produce the thickness indicated within the following tolerances:
  - 1. Base Course: Plus or minus one-half inch.
  - 2. Surface Course: Plus one-fourth inch (no minus).
- B. Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:
  - 1. Base Course: One-fourth inch.
  - 2. Surface Course: One-eighth inch.
  - 3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is one-fourth inch.

**3.7 PAVEMENT MARKING**

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.
- B. Allow paving to age for 30 days before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.

**3.8 WHEEL STOPS**

- A. Securely attach wheel stops into pavement with not less than two galvanized steel dowels embedded at one-quarter to one-third points. Securely install dowels into pavement and bond to wheel stop. Recess head of dowel one inch beneath top of wheel stop.

**3.9 FIELD QUALITY CONTROL**

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and to prepare test reports.
- B. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- C. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.





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HOT-MIX ASPHALT PAVING**

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**3.10 DISPOSAL**

- A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.

**END OF SECTION**

**SECTION 32 13 13  
CONCRETE PAVING**

**PART 1 – GENERAL**

**1.1 SUMMARY**

A. This Section includes exterior cement concrete pavement for the following:

1. Driveways and roadways.
2. Parking lots.
3. Curbs and gutters.
4. Walkways.

**1.2 SUBMITTALS**

- A. Product Data: For each type of product indicated, including admixtures.
- B. Design Mixtures: For each concrete pavement mixture.

**1.3 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C 94/C 94M requirements for production facilities and equipment.
- B. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by requirements in the Contract Documents.
- C. All work to be performed and materials to be used shall be in accordance with the Standard Specifications for Public Works Construction, latest edition and supplements.
- D. The Contractor shall have one copy of the Standard Specifications at the job site.
- E. The Standard Specifications apply only to performance and materials and how they are to be incorporated into the Work. The legal/contractual relationship sections and the measurement and pavement sections do not apply to this document.

**PART 2 – PRODUCTS**

**2.1 CONCRETE MATERIALS**

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source throughout the Project:
  1. Portland Cement: ASTM C 150, Type II, <Revise as necessary to Type V if required by geotechnical report. Coordinate revised cement type with Sewer, Storm, and Water specifications> low alkali. Supplement with the following:
    - a. Pozzolan: ASTM C618, Class F or N Fly Ash, 100 pounds maximum per cubic yard, containing one percent or less carbon. Fly ash shall not be used in excess of 15 percent by weight of total cement quantity.



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## **DIVISION 32**

- B. Combined Aggregates: Gradation "C" conforming to SSPWC Section 201-1.3.2.
- C. Water: ASTM C 94/C 94M.

### **2.2 CURING MATERIALS**

- A. Liquid Curing Compound: ASTM C309, fugitive dye dissipating type, complying with Rule II 13 of the South Coast Air Quality Management District and Federal Air Quality Regulation 40 CFR 52.254.
- B. Moisture-Retaining Cover (Curing Sheet): ASTM C 171, non-staining polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.

### **2.3 RELATED MATERIALS**

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery with emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.
- C. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with Caltrans Standard Specifications - Section 84 (Federal Specification No. TT-P-1952 for Blue, Red and Green paint; and State of California Standard Specification No. PTWB-01 for White, Yellow and Black paint) with drying time of less than 45 minutes.
  - 1. Color: As indicated.

### **2.4 WHEEL STOPS**

- A. Wheel Stops: Precast, air-entrained concrete.
  - 1. Dowels: Galvanized steel, one-half-inch diameter, 18-inch minimum length.

### **2.5 CONCRETE MIXTURES**

- A. Prepare design mixtures, proportioned according to ACI 301, with the following properties:
  - 1. Compressive Strength (28 Days): Minimum 2,500 pounds per square inch (psi). Maximum 3,250 pounds per square inch (psi).
  - 2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.60.

3. Slump Limit: Four inches, plus or minus one inch.

## **2.6 CONCRETE MIXING**

- A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Furnish batch certificates to Architect for each batch discharged and used in the Work.

## **PART 3 – EXECUTION**

### **3.1 EXAMINATION**

- A. Proof-roll prepared subbase surface below concrete pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding.

### **3.2 EDGE FORMS AND SCREED CONSTRUCTION**

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

### **3.3 STEEL REINFORCEMENT**

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

### **3.4 JOINTS**

- A. General: Form construction, isolation, and control joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
- D. Control Joints: Form weakened-plane control joints, sectioning concrete into areas as indicated. Within 24 hours of pour, construct control joints for a depth equal to at least one-fourth of the concrete thickness to match jointing of existing adjacent concrete pavement.
- E. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to a one-fourth-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

**3.5 CONCRETE PLACEMENT**

- A. Moisten subbase to provide a uniform dampened condition at time concrete is placed.
- B. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.
- C. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- D. Screed pavement surfaces with a straightedge and strike off.
- E. Commence initial floating using bull floats or darbies to impart an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

**3.6 FLOAT FINISHING**

- A. General: Do not add water to concrete surfaces during finishing operations.
- B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
  - 1. Refer to Architectural plans for concrete finish.

**3.7 CONCRETE PROTECTION AND CURING**

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Comply with ACI 306.1 for cold-weather protection.
- C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 pounds/square feet x h before and during finishing operations. Apply according to manufacturers written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound or a combination of these methods.

**3.8 PAVEMENT TOLERANCES**

- A. Comply with tolerances as follows
  - 1. Elevation: One-fourth inch.

2. Thickness: Plus three-eighths inch minus one-fourth inch.
3. Surface: Gap below 10-foot long, unleveled straightedge not to exceed one-fourth inch.
4. Joint Spacing: Three inches.
5. Contraction Joint Depth: Plus one-fourth inch no minus.
6. Joint Width: Plus one-eighth inch, no minus.

### **3.9 PAVEMENT MARKING**

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.
- B. Allow concrete pavement to cure for 28 days and be dry before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.

### **3.10 WHEEL STOPS**

- A. Securely attach wheel stops into pavement with not less than two galvanized steel dowels embedded in holes drilled or cast into wheel stops at one-quarter to one-third points. Firmly bond each dowel to wheel stop and to pavement. Securely install dowels into pavement and bond to wheel stop. Recess head of dowel one inch beneath top of wheel stop.

### **3.11 REPAIRS AND PROTECTION**

- A. Remove and replace concrete pavement that is broken, damaged, or defective or that does not comply with requirements in this Section.
- B. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement.
- C. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

**END OF SECTION**

**SECTION 32 13 73  
CONCRETE PAVEMENT JOINT SEALANTS**

**PART 1 – GENERAL**

**1.1 SUMMARY**

- A. This Section includes the following:
  - 1. Expansion and isolation joints within cement concrete pavement.

**1.2 SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Compatibility and Adhesion Test Reports: From sealant manufacturer.

**1.3 QUALITY ASSURANCE**

- A. Preconstruction Compatibility and Adhesion Testing: Submit samples of materials that will contact or affect joint sealants to joint-sealant manufacturers for testing according to manufacturer's standard test method to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

**PART 2 – PRODUCTS**

**2.1 MANUFACTURERS**

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.

**2.2 MATERIALS, GENERAL**

- A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer based on testing and field experience.
  - 1. Primers: Product 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. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

**2.3 COLD-APPLIED JOINT SEALANTS**

- A. Type NS Silicone Sealant for Concrete: Single-component, low-modulus, neutral-curing, nonsag silicone sealant complying with ASTM D 5893 for Type NS.
  - 1. Products:



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- a. Crafcro Inc.; RoadSaver Silicone.
  - b. Dow Corning Corporation; 888.
  - c. Or any equivalent product.
- B. Type SL Silicone Sealant for Concrete: Single-component, low-modulus, neutral-curing, self-leveling silicone sealant complying with ASTM D 5893 for Type SL.
- 1. Products:
    - a. Crafcro Inc.; RoadSaver Silicone SL.
    - b. Dow Corning Corporation; 890-SL.
    - c. Or any equivalent product.

#### 2.4 HOT-APPLIED JOINT SEALANTS

- A. Elastomeric Sealant for Concrete: Single-component formulation complying with ASTM D 3406.
- 1. Products:
    - a. Crafcro Inc.; Superseal 444/777.
    - b. Meadows, W. R., Inc.; Poly-Jet 3406.
    - c. Or any equivalent product.

#### 2.5 JOINT-SEALANT BACKER MATERIALS

- A. General: Provide joint-sealant backer materials that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by joint-sealant manufacturer based on field experience and laboratory testing.
- B. Round Backer Rods for Cold-Applied Sealants: ASTM D 5249, Type 3, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.
- C. Backer Strips for Cold-Applied Sealants: ASTM D 5249; Type 2; of thickness and width required to control sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

### PART 3 – EXECUTION

#### 3.1 INSTALLATION

- A. Concrete curing requirement: The concrete must be allowed to cure and dry a minimum of seven days in good drying weather before installing sealant. An additional day of good drying weather must be allowed for each day of poor, inclement weather.





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CONCRETE PAVEMENT JOINT  
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- B. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.
- C. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience.
- D. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- E. Install backer materials to support sealants during application and at position required to produce optimum sealant movement capability. Do not leave gaps between ends of backer materials. Do not stretch, twist, puncture, or tear backer materials. Remove absorbent backer materials that have become wet before sealant application and replace them with dry materials.
- F. Install sealants at the same time backings are installed to completely fill recesses provided for each joint configuration and to produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- G. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
- H. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

**END OF SECTION**

**SECTION 33 11 00  
WATER UTILITY DISTRIBUTION PIPING**

**PART 1 – GENERAL**

**1.1 SUMMARY**

- A. Requirements: Provide water distribution system, complete, as indicated on the Drawings or inferable therefrom and/or as specified in accordance with the Contract Documents.

**1.2 SUBMITTALS**

- A. Product Data: Submit copies of manufacturer's specifications and installation instructions for each material. Include certification or other data verifying compliance with required characteristics. Indicate by transmittal form that copy of each has been distributed to the Installer.
- B. Shop Drawings: Submit layout and shop drawings as required under Section Submittals. Include details of reinforced concrete structures.
- C. Test Reports: Submit certified Test Reports showing compliance of the following items in accordance with Section General Conditions.
  - 1. Laboratory test for bedding and trench stabilization materials.
  - 2. Concrete design mix.
  - 3. Compression tests.
  - 4. Water Test Reports: Submit results of water sample tests by State or local health authorities

**1.3 QUALITY ASSURANCE**

- A. Regulatory Requirements:
  - 1. Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.
  - 2. All work to be performed and materials to be used shall be in accordance with the Standard Specifications for Public Works Construction, latest edition and supplements.
  - 3. The Contractor shall have one copy of the Standard Specifications at the job site.
  - 4. The Standard Specifications apply only to performance and materials and how they are to be incorporated into the Work. The legal/contractual relationship sections and the measurement and pavement sections do not apply to this document.
- B. Piping materials shall bear label, stamp, or other markings of specified testing agency.



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- C. Comply with FM's "Approval Guide" or UL's "Fire Protection Equipment Directory" for fire-service-main products.
- D. NFPA Compliance: Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-service-main piping for fire suppression.
- E. NSF Compliance:
  - 1. Comply with NSF 14 for plastic potable-water-service piping.
  - 2. Comply with NSF 61 for materials for water-service piping and specialties for domestic water.

**1.4 PROJECT CONDITIONS**

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
  - 1. Notify Owner's Representative not less than two days in advance of proposed utility interruptions.
  - 2. Do not proceed with utility interruptions without Owner's Representative written permission.

**1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Prevent damage to materials during loading, transportation, and unloading. Store equipment with moving parts off ground on platforms or skids.

**1.6 COORDINATION**

- A. Coordinate connection to water main with utility company.

**PART 2 – PRODUCTS**

**2.1 MANUFACTURERS**

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
  - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

**2.2 PIPE AND FITTINGS**

- A. PVC, AWWA Pipe (NPS 4 to NPS 12): AWWA C900, Class 305 DR 14, with bell-and-spigot or double-bell ends.



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1. PVC to PVC Fittings: Push-on-Joint, PVC Fittings, ASTM 3139, with elastomeric gasket bell ends, conforming to ASTM D2122 for bell measurements.
2. PVC to Metal Fittings, Valves, and Accessories: Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
  - a. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts. Use corrosion resistant, high strength, low alloy steel, bolts and nuts where in contact with corrosive soil ASTM A 325.

**2.3 VALVES**

A. AWWA, UL/FM Cast-Iron, Gate Valves:

1. Nonrising-Stem, Resilient-Seated Gate Valves: AWWA C509 and UL/F.M. approved, gray- or ductile-iron body and bonnet; with bronze or gray- or ductile-iron gate, resilient seats, bronze stem, and stem nut.
  - a. Minimum Working Pressure: 200 pounds per square inch gauge (psig).
  - b. End Connections: Flanged, push-on rubber gasketed, or mechanical joint, as required.
  - c. Interior Coating: Complying with AWWA C550.

**2.4 GATE VALVE ACCESSORIES AND SPECIALTIES**

- A. Valve Boxes: Comply with AWWA M44 for cast-iron valve boxes. Include top section, adjustable extension of length required for depth of burial of valve, plug with lettering "WATER," bottom section with base of size to fit over valve, and approximately five-inch diameter barrel. Fabricate valve box cover to fit snugly to prevent displacement by traffic.
1. Operating Wrenches: Steel tee-handle with one pointed end, stem of length to operate deepest buried valve, and socket matching valve operating nut.
- B. Vertical-Type Indicator Posts: UL 789, FM-approved, cast-iron body with operating wrench, extension rod, and adjustable cast-iron barrel of length required for depth of burial of valve with tamperproof electrical supervisory switch for connection to the fire alarm control panel system.

**2.5 VALVE APPLICATION**

- A. General Application: Use mechanical-joint-end valves for NPS 3 and larger underground installation. Use threaded- or flanged-end valves for installation in vaults. Use UL/FM, nonrising-stem gate valves for installation with indicator posts. Use corporation valves and curb valves with ends compatible with piping, for NPS 2 and smaller installation.
1. Where specific valve types are not indicated, the following requirements apply:



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- a. Underground Valves, NPS 3 and Larger: AWWA, cast-iron, nonrising-stem, resilient-seated, gate valves with valve box.
- b. Underground Valves, NPS 4 and Larger, for Vertical-Type Indicator Posts: UL/FM, Cast-iron, nonrising-stem gate valves with indicator post.

**2.6 CORROSION-PROTECTION ENCASEMENT FOR PIPING**

- A. Encasement for Underground Metal Piping: ASTM A 674 or AWWA C105, PE film, 0.008-inch minimum thickness, tube, or sheet.

**2.7 WATER METERS**

- A. Water meter(s) indicated on drawings shall be installed by the local water purveyor for the area, unless noted otherwise.

**2.8 BACKFLOW-PREVENTION DEVICES**

- A. General: FM Approved, AWWA, UL Classified, Approved by the Foundation for Cross Connection Control and Hydraulic Research at the University of Southern California. Devices used for drinking water purposes shall be lead-free in accordance with California Health and Safety Code Section 116875.
  - 1. Working Pressure: Maximum working pressure shall be at least 175 pounds per square inch (psi), unless otherwise indicated.
  - 2. Interior Components: Corrosion-resistant materials.
  - 3. Exterior Components: Assembly shall be provided with flanged connections, ductile iron or epoxy coated construction.
- B. Double-Check-Detector Assembly Backflow Preventers: Suitable for continuous pressure application. Include outside screw and yoke gate valves on inlet and outlet, and strainer on inlet. Include test cocks; two positive-seating check valves; and bypass with displacement-type water meter, valves, and double-check backflow preventer. Include tamperproof electrical supervisory switch for connection to tie the fire alarm control panel system.

**2.9 FIRE HYDRANTS**

- A. Before procurement, verify approval has been issued by the Fire Department having jurisdiction.
- B. Wet-Barrel Fire Hydrants: AWWA C503 or UL 312, one NPS 4 and two NPS 2-1/2 outlets, NPS 6 threaded or flanged inlet, and base section with NPS 6 mechanical-joint inlet. Include interior coating according to AWWA C550. Hydrant shall have 150 pounds per square inch gauge (psig) minimum working-pressure design.
  - 1. Outlet Threads: NFPA 1963, with external hose thread used by local fire department. Include cast-iron caps with steel chains.
  - 2. Operating and Cap Nuts: Pentagon, one-and-one-half inches point to flat.



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3. Direction of Opening: Open hydrant valves by turning operating nut to left or counterclockwise.
- C. Combined length of bury and extension shall be as indicated. Where not indicated, install top of hydrant flange three inches above finished surface.
- D. Exterior Finish: "O.S.H.A. safety yellow" Ameritone 719 or approved equal after receiving a prime coat.

**2.10 FIRE DEPARTMENT CONNECTIONS**

- A. Exposed, Freestanding, Fire Department Connections: UL 405, cast-bronze body, with thread inlets according to NFPA 1963 and matching local fire department hose threads, and threaded bottom outlet. Include lugged caps, gaskets, and chains; lugged swivel connection and drop clapper for each hose-connection inlet; 18-inch high brass sleeve; and round escutcheon plate, and all appropriate check valves per NFPA 24.

1. Escutcheon Plate Marking: "AUTO SPKR."

**2.11 THRUST BLOCKS AND ANCHORS**

- A. General: Cast-in-place concrete according to ACI 318/318R, ACI 350R, and the following:
  1. Cement: ASTM C 150, Type II.
  2. Fine Aggregate: ASTM C33, sand.
  3. Coarse Aggregate: ASTM C 33, crushed gravel.
  4. Water: Potable.
  5. Mix Design: Unless otherwise noted in plans: Portland cement mix design, 2,000 pounds per square inch (PSI) minimum 28-day compressive strength, aggregate gradation "C" per SSPWC 201-1.3.2, maximum slump four inches.
- B. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

**PART 3 – EXECUTION**

**3.1 INSPECTION**

- A. Examination: Examine substrates, adjoining construction and conditions under which Work is to be installed. Do not proceed with Work until unsatisfactory conditions have been corrected

**3.2 PREPARATION**

- A. Field Measurements: Verify dimensions before proceeding with Work. Obtain field measurements for work required to be accurately fitted to other construction. Be responsible for accuracy of such measurements and precise fitting and assembly of finished work.



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WATER UTILITY DISTRIBUTION  
PIPING**

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**3.3 JOINT CONSTRUCTION**

- A. Make pipe joints according to the following:
  - 1. Ductile-Iron Piping, Gasketed Joints for Water-Service Piping: AWWA C600 and AWWA M41.
  - 2. Ductile-Iron Piping, Gasketed Joints for Fire-Service-Main Piping: UL 194.
  - 3. Copper Tubing Soldered Joints: ASTM B 828. Use flushable flux and lead-free solder.
  - 4. PVC Piping Gasketed Joints: Use joining materials according to AWWA C900. Construct joints with elastomeric seals and lubricant according to ASTM D 2774 or ASTM D 3139 and pipe manufacturer's written instructions.
  - 5. PVC Schedule 40 and 80 (NPS 1/8 to NPS 3 1/2): Use solvent welding techniques in accordance with ASTM D2855 and the manufacturer's recommendations.
  - 6. Dissimilar Materials Piping Joints: Use adapters compatible with both piping materials, with OD, and with system working pressure.

**3.4 PIPING INSTALLATION**

- A. Project site water lines shall terminate approximately five feet from buildings, unless otherwise indicated on Drawings. Install temporary cap or plug terminals for future connection to building.
- B. Bury piping with depth of cover over top at least 36 inches, unless otherwise indicated.
- C. Comply with NFPA 24 for fire-service-main piping materials and installation.
- D. Install ductile-iron, water-service piping according to AWWA C600 and AWWA M41.
- E. Install copper tube and fittings according to CDA's "Copper Tube Handbook."
- F. Install PVC, AWWA pipe according to AWWA M23 and ASTM F 645.
- G. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports for all lines NPS 3 or greater.
- H. Water Main Connection: Arrange and pay for tap in the water main, water meter, and all associated fees from the water purveyor.

**3.5 CLEARANCE OF WATER LINE**

- A. Building or Structure: Two feet minimum horizontal separation.
- B. Sewer crossing:



**SECTION 33 11 00  
WATER UTILITY DISTRIBUTION  
PIPING**

**DIVISION 33**

1. Typical Conditions: Lay water mains over sanitary sewers to provide vertical separation minimum three feet.
2. Unusual Conditions: If above separation cannot be met, for sewers less than three feet below the water pipe, use the following:
  - a. Install water line with all joints located at least four feet from each side of the sewer pipe.
  - b. Sewer pipe encased in six inches concrete around pipe, and extend four feet either side of water main.
- C. Parallel to Sewer Line: Water line shall not be installed in a common trench with the building sanitary sewer unless both of the following requirements are met:
  1. The bottom of the water pipe, at all points, shall be at least 12 inches above the top of the sewer.
  2. The water pipe shall be placed on a solid shelf excavated at one side of the common trench with a minimum clear horizontal distance of at least 12 inches from the sewer.

**3.6 ANCHORAGE INSTALLATION**

- A. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches for all lines NPS 3 or greater. Include anchorages for the following piping systems:
  1. Gasketed-Joint, Ductile-Iron, Water-Service Piping: According to AWWA C600.
  2. Gasketed-Joint, PVC Water-Service Piping: According to AWWA M23.
  3. Fire-Service-Main Piping: According to NFPA 24.
  4. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

**3.7 VALVE INSTALLATION**

- A. Gate Valves: Comply with AWWA C600 and AWWA M44. Install each underground valve with stem pointing up and with valve box.
- B. Vertical-Type Indicator Post Gate Valves: Comply with NFPA 24. Install each underground valve and valves in vaults with stem pointing up and with vertical cast-iron indicator post. Include tamperproof electrical supervisory switch for connection to tie the fire alarm control panel system.

**3.8 BACKFLOW-PREVENTER INSTALLATION**

- A. Install backflow preventers of type, size, and capacity indicated. Include valves and test cocks. Install according to requirements of plumbing and health department and authorities having jurisdiction.





**SECTION 33 11 00  
WATER UTILITY DISTRIBUTION  
PIPING**

**DIVISION 33**

- B. Do not install backflow preventers with relief drain in vault or other space subject to flooding.
- C. Do not install bypass piping around backflow preventers.
- D. Support three-inch and larger backflow preventers, valves, and piping near floor and on brick or concrete piers.
- E. Access and clearance shall be provided for the required testing, maintenance and repair. Access and clearance shall require a minimum of one foot between the lowest portion of the assembly and grade or platform.
- F. Include tamperproof electrical supervisory switch for connection to tie the fire alarm control panel system.

**3.9 FIRE HYDRANT INSTALLATION**

- A. General: Install each fire hydrant with separate gate valve in supply pipe, anchor with restrained joints or thrust blocks, and support in upright position.
- B. UL/FM-Type Fire Hydrants: Comply with NFPA 24.

**3.10 FIRE DEPARTMENT CONNECTION INSTALLATION**

- A. Install fire department connections of types and features indicated.
- B. Install ball drip valves at each check valve for fire department connection to mains.

**3.11 IDENTIFICATION**

- A. Install continuous underground detectable warning tape during backfilling of trench for underground water-service piping. Locate below finished grade, directly over piping. Refer to Division 31 Section "Earth Moving" for tape specifications.

**3.12 FIELD QUALITY CONTROL**

- A. Piping Tests: Conduct piping tests before joints are covered and after thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.
- B. Hydrostatic Tests: The piping shall be subjected for a minimum of two hours to a pressure of one and one-half times the working pressure, but in no case less than 150 pounds per square inch (psi). Examine all exposed pipe, joints, fittings and accessories during the test period. Replace or repair defective portions of the system, and repeat tests until results are satisfactory.
  - 1. Allowable leakage shall be as specified in AWWA C-600, Table 3.
- C. Prepare reports of testing activities.



**SECTION 33 11 00  
WATER UTILITY DISTRIBUTION  
PIPING**

**DIVISION 33**

**3.13 CLEANING**

- A. Clean and disinfect water-distribution piping as follows:
  - 1. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.
  - 2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or as described below:
    - a. Fill system or part of system with water/chlorine solution containing at least 50 parts per million (ppm) of chlorine; isolate and allow to stand for 24 hours, or
    - b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 parts per million (ppm) of chlorine; isolate and allow to stand for three hours.
    - c. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.
    - d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.
- B. Prepare reports of purging and disinfecting activities.

**END OF SECTION**



TRUST Assignment Number: 10418 & 10834

# Limited Asbestos and Lead Assessment Survey

## Survey Location:

Goleta Valley Library  
500 North Fairview Avenue  
Goleta, CA 93117

## Report Prepared for:

Jeffrey Miller Architecture and Design  
Attn: Jeffrey Miller  
516 North Sepulveda Boulevard  
Manhattan Beach, CA 90266  
[jm@jmadstudio.com](mailto:jm@jmadstudio.com)

Survey Date: October 21, 2024

Return Survey Date: November 18, 2024

Report Dates: October 22 and November 19, 2024

Revised Report Date: January 3, 2025



TRUST Assignment Number: 10418 &amp; 10834

January 3, 2025

Jeffrey Miller Architecture and Design  
Attn: Jeffrey Miller  
516 North Sepulveda Boulevard  
Manhattan Beach, CA 90266  
[jm@jmadstudio.com](mailto:jm@jmadstudio.com)

## Limited Asbestos and Lead Assessment Survey

### Section I: Site Characterization and Background Information

On October 21, 2024, and additionally on November 18, 2024, TRUST Environmental Solutions (TRUST Environmental) conducted a Limited Asbestos and Lead Assessment Survey of the Goleta Valley Library Property located at 500 North Fairview Avenue in Goleta, CA 93117. This survey was completed at the request of Jeffrey Miller Architecture and Design and was completed by Certified Site Surveillance Technician and Lead Sampling Technician, Tara Steiner (CSST# 20-6857 and LRC-00003549), under the direction of Certified Asbestos Consultant and Lead Inspector/Assessor, Victor Ruiz (CAC# 15-5589 and LRC-00011686) who are employees of TRUST Environmental Solutions located at 317 W. Ventura Blvd., #1067, Camarillo, California 93010. Asbestos samples were hand delivered to:

Eurofins Glendale (NVLAP; 200945-0) located at 1010 N. Central Avenue Suite 460, Glendale, CA 91202. EMLab Glendale can be reached at (866) 465-6653 or [EBET.customerservice@et.eurofinsus.com](mailto:EBET.customerservice@et.eurofinsus.com).

Prior to inspection, TRUST Environmental was informed of a planned remodel involving the interior. No obvious structural or fire damages were observed.

### Section II: Results Summary

RESULT: ☒ Asbestos was Detected☐ Asbestos was Not Detected☒ Materials are Lead Based☐ Materials are Lead Containing☐ Materials are Lead Safe

Asbestos **was detected** within the off-white joint compound, white floor tile, and black mastic.

Lead Based Paint **was detected** within the Vestibule brown ceramic flooring, the Women's Restroom tan ceramic walls, the Men's Restroom tan ceramic walls, the Women's Staff Restroom tan ceramic walls, and the Men's Staff Restroom tan ceramic walls. On the additional visit, Lead Based paint **was detected** on the following Exterior areas: Main Entryway - south - brown ceramic flooring, yellow metal handrail, and the Main Entryway - west - brown ceramic flooring. This material is considered Lead Based Paint and requires "Lead Abatement". This material must be handled by a California state licensed Lead Contractor for any work that will disturb any Lead Based Paint.

Lead Containing Paint **was detected**, on the return visit, on the following exterior areas: the Main Entryway - south - yellow wood fascia. This material is considered Lead Containing and does NOT require "Lead Abatement". This material may be handled by a regular contractor who has prepared a Cal/OSHA lead compliance plan for the protection of its workers.

All other materials sampled for lead were found to be **lead safe**.

A total of 33 asbestos PLM bulk samples were collected. 36 samples were analyzed.

\*TRUST Environmental includes the first three (3) layers of material analyzed. Each additional layer analyzed after three (3) is charged as one (1) additional sample. Per EPA Test Method (EPA/600/R 93/116) Section 2.1.5.2, for materials composed of distinct layers or two or more distinct building materials, each layer or distinct building material should be treated as a discrete sample. TRUST Environmental is required to analyze each layer of material until positive material is detected or until all layers are analyzed and no asbestos is detected.

A total of 41 total lead XRF-Analyzer samples were collected and analyzed on site.

Please see Tables I and II below for a summary of the survey results followed by supplemental information including recommendations and testing methodologies.

**Table I: Summary of Asbestos PLM Sample Results - October 21, 2024**

Sample ID	Building Material Sampled	Result	Quantity	Friability	Condition	Air Quality District	P5 Req
A-01	Story Room - Gray Ceiling Tile with White Surface	NAD	120sf*	Friable	G	SBAPCD	No
A-02	Story Room - Gray Ceiling Tile with White Surface	NAD	120sf*	Friable	G	SBAPCD	No
A-03	Story Room - Gray Ceiling Tile with White Surface	NAD	120sf*	Friable	G	SBAPCD	No
B-01	Vestibule Ceiling - Gray Ceiling Tile with White Surface	NAD	3500sf*	Friable	G	SBAPCD	No
B-02	Kitchen Ceiling - Gray Ceiling Tile with White Surface	NAD	3500sf*	Friable	G	SBAPCD	No

B-03	Audio Visual Room – Gray Ceiling Tile with White Surface	NAD	3500sf*	Friable	G	SBAPCD	No
B-04	Hallway – Gray Ceiling Tile with White Surface	NAD	3500sf*	Friable	G	SBAPCD	No
B-05	Men’s Restroom – Gray Ceiling Tile with White Surface	NAD	3500sf*	Friable	G	SBAPCD	No
C-01	Kitchen Walls – White Skim Coat, Gray Plaster	NAD	1000sf*	Non-Friable	G	SBAPCD	No
C-02	Audio Visual Walls – White Skim Coat, Gray Plaster	NAD	1000sf*	Non-Friable	G	SBAPCD	No
C-03	Storage Walls – White Skim Coat, Gray Plaster	NAD	1000sf*	Non-Friable	G	SBAPCD	No
C-04	Multi-Purpose Room Walls – White Skim Coat, Gray Plaster	NAD	1000sf*	Non-Friable	G	SBAPCD	No
C-05	Multi-Purpose Room Walls – White Skim Coat, Gray Plaster	NAD	1000sf*	Non-Friable	G	SBAPCD	No
D-01	<b>Office Walls – Off-White Joint Compound</b>	2%CH	1000sf*	<b>Non-Friable</b>	<b>G</b>	<b>SBAPCD</b>	<b>No</b>
D-01	Office Walls – White Drywall with Brown Paper	NAD(h)	1000sf*	Non-Friable	G	SBAPCD	No
D-02	<b>Conference Room Walls – Off-White Joint Compound</b>	2%CH	1000sf*	<b>Non-Friable</b>	<b>G</b>	<b>SBAPCD</b>	<b>No</b>
D-02	Conference Room Walls – White Drywall with Brown Paper	NAD(h)	1000sf*	Non-Friable	G	SBAPCD	No
D-03	<b>Staff Lounge Walls – Off-White Joint Compound</b>	2%CH	1000sf*	<b>Non-Friable</b>	<b>G</b>	<b>SBAPCD</b>	<b>No</b>
D-03	Staff Lounge Walls – White Drywall with Brown Paper	NAD(h)	1000sf*	Non-Friable	G	SBAPCD	No
D-04	Mechanical Room Walls – White Joint Compound	NAD(h)	1000sf*	Non-Friable	G	SBAPCD	No
D-04	Mechanical Room Walls – White Drywall	NAD(h)	1000sf*	Non-Friable	G	SBAPCD	No

D-05	Janitor Closet Walls - White Joint Compound	NAD(h)	1000sf*	Non-Friable	G	SBAPCD	No
D-05	Janitor Closet Walls - White Drywall	NAD(h)	1000sf*	Non-Friable	G	SBAPCD	No
E-01	Kitchen - Orange Cove Base, Brown Glue	NAD	20sf*	Non-Friable	G	SBAPCD	No
E-02	Kitchen - Orange Cove Base, Brown Glue	NAD	20sf*	Non-Friable	G	SBAPCD	No
E-03	Kitchen - Orange Cove Base, Brown Glue	NAD	20sf*	Non-Friable	G	SBAPCD	No
F-01	Audio Visual - Brown Cove Base, Brown Glue, White Skim Coat, Gray Plaster	NAD	40sf*	Non-Friable	G	SBAPCD	No
F-02	Audio Visual - Brown Cove Base, Brown Glue, White Skim Coat, Gray Plaster	NAD	40sf*	Non-Friable	G	SBAPCD	No
F-03	Audio Visual - Brown Cove Base, Brown Glue, White Skim Coat, Gray Plaster	NAD	40sf*	Non-Friable	G	SBAPCD	No
G-01	Audio Visual - White Floor Tile	2%CH	150sf*	Non-Friable	G	SBAPCD	No
G-01	Audio Visual - Black Mastic	3%CH	150sf*	Non-Friable	G	SBAPCD	No
G-02	Audio Visual - White Floor Tile	2%CH	150sf*	Non-Friable	G	SBAPCD	No
G-02	Audio Visual - Black Mastic	3%CH	150sf*	Non-Friable	G	SBAPCD	No
G-03	Kitchen - White Floor Tile	2%CH	150sf*	Non-Friable	G	SBAPCD	No
G-03	Kitchen - Black Mastic	3%CH	150sf*	Non-Friable	G	SBAPCD	No

**Reference Legend:**

NAD - No Asbestos Detected, CH - Chrysotile Asbestos

NAD (h) - No Asbestos Detected but material is still considered asbestos containing due to being part of a homogenous area.

NAD (t) - No Asbestos Detected but material is still considered to have trace level asbestos due to being part of a homogenous area.

sf\* - Estimated Square Feet

G - Good, D - Damaged, SD - Significantly Damaged

SCAQMD - South Coast Air Quality Management District, AVAQMD - Antelope Valley Air Quality Management District, VCAPCD - Ventura County Air Pollution Control District, SBAPCD Santa Barbara Air Pollution Control District

**Table II: Summary of Asbestos PLM Sample Results – November 18, 2024**

Sample ID	Building Material Sampled	Result	Quantity	Friability	Condition	Air Quality District	P5 Req
A-01	Exterior Main Entryway - South - Black Caulk	NAD	10sf*	Non-Friable	G	SBAPCD	No
A-02	Exterior Main Entryway - South - Black Caulk	NAD	10sf*	Non-Friable	G	SBAPCD	No
A-03	Exterior Main Entryway - South - Black Caulk	NAD	10sf*	Non-Friable	G	SBAPCD	No
B-01	Exterior Main Entryway - West - Gray Caulk	NAD	10sf*	Non-Friable	G	SBAPCD	No
B-02	Exterior Multi-Purpose Room - Entryway - Gray Caulk	NAD	10sf*	Non-Friable	G	SBAPCD	No
B-03	Exterior Staff Lounge Entryway - Gray Caulk	NAD	10sf*	Non-Friable	G	SBAPCD	No

**Reference Legend:**

NAD - No Asbestos Detected, CH - Chrysotile Asbestos

NAD (h) - No Asbestos Detected but material is still considered asbestos containing due to being part of a homogenous area.

NAD (t) - No Asbestos Detected but material is still considered to have trace level asbestos due to being part of a homogenous area.

sf\* - Estimated Square Feet

G - Good, D - Damaged, SD - Significantly Damaged

SCAQMD - South Coast Air Quality Management District, AVAQMD - Antelope Valley Air Quality Management District, VCAPCD - Ventura County Air Pollution Control District, SBAPCD Santa Barbara Air Pollution Control District

**Table III: Summary of Lead XRF-gun Sample Results – October 21, 2024**

Sample ID	Location	Color of Material	Type of Material Sampled	Condition	Result
LP-01	Vestibule	Beige	Plaster Walls	Intact	<0.1mg/cm2
LP-02	Vestibule	Brown	Wood Baseboard	Intact	<0.1mg/cm2
LP-03	Vestibule	Brown	Ceramic Flooring	Intact	1.6mg/cm2
LP-04	Multi-Purpose Room	Beige	Wallpaper Walls	Intact	<0.1mg/cm2
LP-05	Multi-Purpose Room	Brown	Wood Baseboard	Intact	<0.1mg/cm2
LP-06	Multi-Purpose Room	Brown	Wood Char Rail	Intact	<0.1mg/cm2
LP-07	Kitchen	White	Plaster Walls	Intact	<0.1mg/cm2



LP-08	Kitchen	Varnnish	Wood Cabinets	Intact	<0.1mg/cm2
LP-09	Audio Visual Room	White	Plaster Walls	Intact	<0.1mg/cm2
LP-10	Women's Restroom	Tan	Ceramic Walls	Intact	5.0mg/cm2
LP-11	Women's Restroom	Multi-Colored	Ceramic Flooring	Intact	<0.1mg/cm2
LP-12	Men's Restroom	Tan	Ceramic Walls	Intact	7.5mg/cm2
LP-13	Men's Restroom	Multi-Colored	Ceramic Flooring	Intact	<0.1mg/cm2
LP-14	Children's Reading	Cream	Drywall Walls	Intact	<0.1mg/cm2
LP-15	Children's Reading	Brown	Wood Baseboard	Intact	<0.1mg/cm2
LP-16	Story Room	White	Drywall Walls	Intact	<0.1mg/cm2
LP-17	Teen Corner	Cream	Drywall Walls	Intact	<0.1mg/cm2
LP-18	Office	Cream	Drywall Walls	Intact	<0.1mg/cm2
LP-19	Staff Work Room	White	Drywall Walls	Intact	<0.1mg/cm2
LP-20	Staff Work Room	White	Brick Walls	Intact	<0.1mg/cm2
LP-21	Conference Room	Cream	Drywall Walls	Intact	<0.1mg/cm2
LP-22	Corridor	Cream	Drywall Walls	Intact	<0.1mg/cm2
LP-23	Staff Lounge	Cream	Drywall Walls	Intact	<0.1mg/cm2
LP-24	Women's Staff Restroom	Tan	Ceramic Walls	Intact	8.2mg/cm2
LP-25	Women's Staff Restroom	Multi-Colored	Ceramic Flooring	Intact	<0.1mg/cm2
LP-26	Men's Staff Restroom	Tan	Ceramic Walls	Intact	9.9mg/cm2
LP-27	Men's Staff Restroom	Multi-Colored	Ceramic Flooring	Intact	<0.1mg/cm2
LP-28	Mechanical Room	White	Drywall Ceiling	Intact	<0.1mg/cm2
LP-29	Mechanical Room	White	Drywall Walls	Intact	<0.1mg/cm2

LP-30	Mechanical Room	White	Wood Baseboard	Intact	<0.1mg/cm2
LP-31	Janitor	White	Drywall Walls	Intact	<0.1mg/cm2

**Table IV: Summary of Lead XRF-gun Sample Results - November 18, 2024**

Sample ID	Location	Color of Material	Type of Material Sampled	Condition	Result
LP-01	Exterior Main Entryway - South	Yellow	Wood Fascia	Intact	0.3mg/cm2
LP-02	Exterior Main Entryway - South	Brown	Ceramic Flooring	Intact	1.8mg/cm2
LP-03	Exterior Main Entryway - South	Yellow	Metal Handrail	Intact	3.0mg/cm2
LP-04	Exterior Main Entryway - West	Yellow	Wood Fascia	Intact	<0.1mg/cm2
LP-05	Exterior Main Entryway - West	Brown	Ceramic Flooring	Intact	1.8mg/cm2
LP-06	Exterior Staff Room Entryway	Yellow	Wood Fascia	Intact	<0.1mg/cm2
LP-07	Exterior Staff Room Entryway	White	Wood Door	Intact	<0.1mg/cm2
LP-08	Exterior Break Room Entryway	Yellow	Wood Fascia	Intact	<0.1mg/cm2

LP-09	Exterior Main Entryway	Orange	Wood Fascia	Intact	<0.1mg/cm <sup>2</sup>
LP-10	Exterior Northwest Window	Yellow	Wood Fascia	Intact	<0.1mg/cm <sup>2</sup>

### Section III: Recommendations

#### Asbestos Recommendations:

- ☐ NAD - Asbestos was not detected within the sampled area. No further action is required.
- ☐ ≤0.1% CH - This material was further analyzed by point count and the asbestos found was determined to be at trace level. The contractor must comply with Cal/OSHA asbestos exposure monitoring. Although the material is below quantifiable limits of asbestos, contracted employees should be instructed on wet methods of removal, HEPA vacuuming, prompt clean up, and the prevention of raising dust while work is performed.
- ☐ <1% CH - Asbestos was detected in trace amounts in the sampled area. This material may be further analyzed by 1000-point count at the request of the client to determine the method of removal that must be used. If not further analyzed or determined to be >0.1% and <1% CH by point count, this material must be treated as asbestos containing material. Any work that will disturb asbestos containing materials or asbestos containing construction materials must be completed by a California state licensed Asbestos Abatement Contractor. Abatement activities must be performed by asbestos trained personnel using proper PPE and controls. The abatement contractor must comply with all local, state, and federal regulations governing the removal and/or disturbance of Asbestos Containing Materials.
- ☒ Greater than 1% CH - Asbestos was detected in amounts greater than 1% CH in the sampled area. This material must be treated as asbestos containing material. Any work that will disturb asbestos containing materials or asbestos containing construction materials must be completed by a California state licensed Asbestos Abatement Contractor. Abatement activities must be performed by asbestos trained personnel using proper PPE and controls. The abatement contractor must comply with all local, state, and federal regulations governing the removal and/or disturbance of Asbestos Containing Materials.

#### Lead Recommendations:

- ☐ The material contains <200 PPM or <0.1 mg/cm<sup>2</sup> - Material is considered Lead Safe.
- ☐ <5000PPM or <1.0 mg/cm<sup>2</sup> (or <0.7mg/cm<sup>2</sup> if in LA County) - This material is considered Lead Containing and does NOT require "Lead Abatement". This material may be handled by a regular contractor who has prepared a Cal/OSHA lead compliance plan for the protection of its workers.
- ☒ ≥5000PPM or ≥1.0 mg/cm<sup>2</sup> (or ≥0.7mg/cm<sup>2</sup> if in LA County) - This material is considered Lead Based Paint and requires "Lead Abatement". This material must be handled by a California state licensed Lead Contractor for any work that will disturb any Lead Based Paint.

#### **Section IV: Purpose and Methodologies**

The purpose of this survey assessment was to identify Asbestos Containing Materials (ACM) and Lead Containing Materials that may be impacted by planned repair, remodel, renovation and/or demolition activities at the survey location. TRUST Environmental first conducted a visual inspection of the survey location to identify and assess the condition of materials to be sampled.

Bulk material samples of suspected asbestos containing material were collected, categorized into homogenous groupings, labeled a unique sample number for each sample, and placed into a sealed container. Asbestos samples were analyzed via Polarized Light Microscopy (PLM) for asbestos content by an accredited laboratory listed below. Principles described in the EPA 600 method were used in the preparation and analysis of the bulk samples. US EPA government regulation requires that a limited number of samples be collected from each identified homogenous area. If one sample in a homogenous area is determined to be asbestos containing, the entire homogenous area must be considered asbestos containing, even if no asbestos was detected in any other samples within the homogenous area. No destructive sampling was conducted. As such, any inaccessible areas that would require destructive sampling were not inspected or sampled. All areas that renovation or demolition plans will impact must be inspected or sampled. Asbestos bulk samples were delivered to and analyzed via PLM by an accredited laboratory.

The specific number of samples collected was determined by using the methods required by the Federal AHERA regulations (40 CFR, Part 763.86) as noted below:

1) For Surfacing Material:

1,000 ft<sup>2</sup> or less - collect 3 samples

1,001 to 5,000 ft<sup>2</sup> - collect 5 samples

5,001 ft<sup>2</sup> or greater - collect 7 samples

2) For Thermal System Insulation:

"In a randomly distributed manner" - collect 3 samples

6 linear feet of patching or less - collect 1 sample

cementitious pipe fittings - "In a manner sufficient to determine"

3) For all Miscellaneous Material:

Collect samples "In a manner sufficient to determine whether material is ACM (asbestos containing material) or not ACM."

Lead samples were taken via XRF-gun and analyzed on site for lead content.

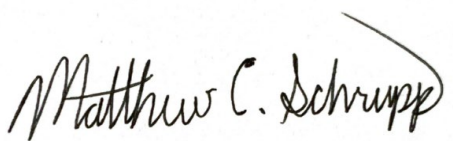
## Section V: Limitations

TRUST Environmental Solutions presents this report and makes the above recommendations based on limitations of the analytical method, along with independent research and industry consensus. TRUST Environmental and representatives of TRUST Environmental are not licensed as Medical Professionals and can make no medical diagnoses. TRUST Environmental was limited to the conditions and observations present only on the day of inspection. Environmental testing is an imperfect science and Asbestos Surveying is limited. In addition, reports may contain inaccuracies. TRUST Environmental may revise the above content of this report at any time when presented with new information. Any reference to quantities within this report are estimates and are not actual. TRUST Environmental was limited to standard practices, the scope of services, parameters of the analytical method used, and conditions present at the time of inspection.

Thank you for choosing TRUST Environmental Solutions. Please contact us at (805) 72-TRUST or TestIt@TRUSTenv.com for any additional testing needs. Please contact the Reports Department at GetResults@TRUSTenv.com for any questions or requested revisions regarding this report and we would be happy to assist you.

Written By:

Reviewed By:



Matthew Schrupp  
Senior Technical Report Writer  
[Matthew.Schrupp@Trustenv.com](mailto:Matthew.Schrupp@Trustenv.com)  
(805) 72-TRUST  
TRUST Environmental Solutions  
317 W. Ventura Blvd., #1067  
Camarillo, California 93010

Victor Ruiz  
Certified Asbestos Consultant (15-5589)  
[Victor.Ruiz@TrustEnv.com](mailto:Victor.Ruiz@TrustEnv.com)  
(805) 750-6342  
TRUST Environmental Solutions  
317 W. Ventura Blvd., #1067  
Camarillo, California 93010

## Section VI: Appendices

Please see below for any relevant analytical results, site diagrams, and certifications regarding the above project.

# APPENDIX A – ANALYTICAL RESULTS AND CHAIN OF CUSTODY



Report for:

**Lab Results**  
**TRUST Environmental Solutions**  
317 Ventura Blvd.  
#1067  
Camarillo, CA 93010

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Regarding: Eurofins EPK Built Environment Testing, LLC  
Project: 10418; Goleta Valley Library 500 North Fairview Avenue, Goleta, CA 93117  
EML ID: 3824199

Approved by:

Dates of Analysis:  
Asbestos PLM: 10-22-2024



Approved Signatory  
Roshanak Kalantari

Service SOPs: Asbestos PLM (EPA 40CFR App E to Sub E of Part 763 & EPA METHOD 600/R-93-116, SOP EM-AS-S-1267)  
NVLAP Lab Code 200945-0

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All samples were received in acceptable condition unless noted in the Report Comments portion in the body of the report. The results relate only to the samples as received and tested. The results include an inherent uncertainty of measurement associated with estimating percentages by polarized light microscopy. Measurement uncertainty data for sample results with >1% asbestos concentration can be provided when requested.

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Client: TRUST Environmental Solutions  
C/O: Lab Results  
Re: 10418; Goleta Valley Library 500 North  
Fairview  
Avenue, Goleta, CA 93117

**Eurofins EPK Built Environment Testing, LLC**  
1010 N Central Avenue, Suite 460, Glendale, CA 91202  
(833) 465-5857 www.eurofinsus.com/Built

Date of Receipt: 10-22-2024  
Date of Report: 10-22-2024

## ASBESTOS PLM REPORT

**Total Samples Submitted:** 27

**Total Samples Analyzed:** 27

**Total Samples with Layer Asbestos Content > 1%:** 6

### Location: A01, Story room ceiling acoustic tiles 2x2

Lab ID-Version‡: 18893048-1

Sample Layers	Asbestos Content
Gray Ceiling Tile with White Surface	ND
<b>Composite Non-Asbestos Content:</b>	40% Cellulose 20% Glass Fibers
<b>Sample Composite Homogeneity:</b>	Good

### Location: A02, Story room ceiling acoustic tiles 2x2

Lab ID-Version‡: 18893049-1

Sample Layers	Asbestos Content
Gray Ceiling Tile with White Surface	ND
<b>Composite Non-Asbestos Content:</b>	40% Cellulose 20% Glass Fibers
<b>Sample Composite Homogeneity:</b>	Good

### Location: A03, Story room ceiling acoustic tiles 2x2

Lab ID-Version‡: 18893050-1

Sample Layers	Asbestos Content
Gray Ceiling Tile with White Surface	ND
<b>Composite Non-Asbestos Content:</b>	40% Cellulose 20% Glass Fibers
<b>Sample Composite Homogeneity:</b>	Good

### Location: B01, Vestibule ceiling acoustic tiles 1x1

Lab ID-Version‡: 18893051-1

Sample Layers	Asbestos Content
Gray Ceiling Tile with White Surface	ND
<b>Composite Non-Asbestos Content:</b>	55% Glass Fibers
<b>Sample Composite Homogeneity:</b>	Good

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## ASBESTOS PLM REPORT

### Location: B02, Kitchen ceiling acoustic tiles 1x1

Lab ID-Version‡: 18893052-1

Sample Layers	Asbestos Content
Gray Ceiling Tile with White Surface	ND
<b>Composite Non-Asbestos Content:</b>	55% Glass Fibers
<b>Sample Composite Homogeneity:</b>	Good

### Location: B03, Audio/visual room ceiling acoustic tiles 1x1

Lab ID-Version‡: 18893053-1

Sample Layers	Asbestos Content
Gray Ceiling Tile with White Surface	ND
<b>Composite Non-Asbestos Content:</b>	55% Glass Fibers
<b>Sample Composite Homogeneity:</b>	Good

### Location: B04, Hallway ceiling acoustic tiles 1x1

Lab ID-Version‡: 18893054-1

Sample Layers	Asbestos Content
Gray Ceiling Tile with White Surface	ND
<b>Composite Non-Asbestos Content:</b>	55% Glass Fibers
<b>Sample Composite Homogeneity:</b>	Good

### Location: B05, Mens restroom ceiling acoustic tiles 1x1

Lab ID-Version‡: 18893055-1

Sample Layers	Asbestos Content
Gray Ceiling Tile with White Surface	ND
<b>Composite Non-Asbestos Content:</b>	55% Glass Fibers
<b>Sample Composite Homogeneity:</b>	Good

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## ASBESTOS PLM REPORT

### Location: C01, Kitchen walls plaster

Lab ID-Version‡: 18893056-1

Sample Layers	Asbestos Content
White Skim Coat	ND
Gray Plaster	ND
Sample Composite Homogeneity: Moderate	

### Location: C02, Audio visual walls plaster

Lab ID-Version‡: 18893057-1

Sample Layers	Asbestos Content
White Skim Coat	ND
Gray Plaster	ND
Sample Composite Homogeneity: Moderate	

### Location: C03, Storage walls plaster

Lab ID-Version‡: 18893058-1

Sample Layers	Asbestos Content
White Skim Coat	ND
Gray Plaster	ND
Sample Composite Homogeneity: Moderate	

### Location: C04, Multi purpose room walls plaster

Lab ID-Version‡: 18893059-1

Sample Layers	Asbestos Content
White Skim Coat	ND
Gray Plaster	ND
Sample Composite Homogeneity: Moderate	

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Date of Report: 10-22-2024

## ASBESTOS PLM REPORT

**Location: C05, Multi purpose room walls plaster**

Lab ID-Version‡: 18893060-1

Sample Layers	Asbestos Content
White Skim Coat	ND
Gray Plaster	ND
<b>Sample Composite Homogeneity:</b>	Moderate

**Location: D01, Office walls djc**

Lab ID-Version‡: 18893061-1

Sample Layers	Asbestos Content
Off-White Joint Compound	2% Chrysotile
White Drywall with Brown Paper	ND
<b>Composite Non-Asbestos Content:</b>	10% Cellulose
<b>Sample Composite Homogeneity:</b>	Moderate

**Location: D02, Conference room walls djc**

Lab ID-Version‡: 18893062-1

Sample Layers	Asbestos Content
Off-White Joint Compound	2% Chrysotile
White Drywall with Brown Paper	ND
<b>Composite Non-Asbestos Content:</b>	10% Cellulose
<b>Sample Composite Homogeneity:</b>	Moderate

**Location: D03, Staff lounge walls djc**

Lab ID-Version‡: 18893063-1

Sample Layers	Asbestos Content
Off-White Joint Compound	2% Chrysotile
White Drywall with Brown Paper	ND
<b>Composite Non-Asbestos Content:</b>	10% Cellulose
<b>Sample Composite Homogeneity:</b>	Moderate

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## ASBESTOS PLM REPORT

**Location: D04, Mech room walls djc**

Lab ID-Version‡: 18893064-1

Sample Layers	Asbestos Content
White Joint Compound	ND
White Drywall with Brown Paper	ND
<b>Composite Non-Asbestos Content:</b>	10% Cellulose
<b>Sample Composite Homogeneity:</b>	Moderate

**Location: D05, Janitor closet walls djc**

Lab ID-Version‡: 18893065-1

Sample Layers	Asbestos Content
White Joint Compound	ND
White Drywall	ND
<b>Sample Composite Homogeneity:</b>	Moderate

**Location: E01, Kitchen orange cove base w/glue**

Lab ID-Version‡: 18893066-1

Sample Layers	Asbestos Content
Orange Cove Base	ND
Brown Glue	ND
<b>Composite Non-Asbestos Content:</b>	2% Talc
<b>Sample Composite Homogeneity:</b>	Moderate

**Location: E02, Kitchen orange cove base w/glue**

Lab ID-Version‡: 18893067-1

Sample Layers	Asbestos Content
Orange Cove Base	ND
Brown Glue	ND
<b>Composite Non-Asbestos Content:</b>	2% Talc
<b>Sample Composite Homogeneity:</b>	Moderate

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Date of Receipt: 10-22-2024  
Date of Report: 10-22-2024

## ASBESTOS PLM REPORT

**Location: E03, Kitchen orange cove base w/glue**

Lab ID-Version‡: 18893068-1

Sample Layers	Asbestos Content
Orange Cove Base	ND
Brown Glue	ND
<b>Composite Non-Asbestos Content:</b>	2% Talc
<b>Sample Composite Homogeneity:</b>	Moderate

**Location: F01, Audio visual brown cove base w/glue**

Lab ID-Version‡: 18893069-1

Sample Layers	Asbestos Content
Brown Cove Base	ND
Brown Glue	ND
White Skim Coat	ND
Gray Plaster	ND
<b>Composite Non-Asbestos Content:</b>	2% Talc
<b>Sample Composite Homogeneity:</b>	Moderate

**Location: F02, Audio visual brown cove base w/glue**

Lab ID-Version‡: 18893070-1

Sample Layers	Asbestos Content
Brown Cove Base	ND
Brown Glue	ND
White Skim Coat	ND
Gray Plaster	ND
<b>Composite Non-Asbestos Content:</b>	2% Talc
<b>Sample Composite Homogeneity:</b>	Moderate

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C/O: Lab Results  
Re: 10418; Goleta Valley Library 500 North  
Fairview  
Avenue, Goleta, CA 93117

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Date of Report: 10-22-2024

## ASBESTOS PLM REPORT

**Location: F03, Audio visual brown cove base w/glue**

Lab ID-Version‡: 18893071-1

Sample Layers	Asbestos Content
Brown Cove Base	ND
Brown Glue	ND
White Skim Coat	ND
Gray Plaster	ND
<b>Composite Non-Asbestos Content:</b>	2% Talc
<b>Sample Composite Homogeneity:</b>	Moderate

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## ASBESTOS PLM REPORT

### Location: G-01, Audio Visual Room Flooring with Mastic

Lab ID-Version‡: 18893374-1

Sample Layers	Asbestos Content
White Floor Tile	2% Chrysotile
Black Mastic	3% Chrysotile
Sample Composite Homogeneity: Moderate	

### Location: G-02, Audio Visual Room Flooring with Mastic

Lab ID-Version‡: 18893375-1

Sample Layers	Asbestos Content
White Floor Tile	2% Chrysotile
Black Mastic	3% Chrysotile
Sample Composite Homogeneity: Moderate	

### Location: G-03, Kitchen Flooring with Mastic

Lab ID-Version‡: 18893376-1

Sample Layers	Asbestos Content
White Floor Tile	2% Chrysotile
Black Mastic	3% Chrysotile
Sample Composite Homogeneity: Moderate	

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Date of Receipt: 10-22-2024  
Date of Report: 10-22-2024

## **ASBESTOS PLM REPORT**

### **PROJECT ANALYST AND SIGNATORY REPORT**

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#### **Project Analyst**



---

**Analyst:** Buapha Laophio

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Report for:

**Lab Results**  
**TRUST Environmental Solutions**  
317 Ventura Blvd.  
#1067  
Camarillo, CA 93010

---

Regarding: Eurofins EPK Built Environment Testing, LLC  
Project: 10834; Goleta Valley Library, 500 North Fairview Ave, Goleta, CA 93117  
EML ID: 3855837

Approved by:

Dates of Analysis:  
Asbestos PLM: 11-18-2024



Approved Signatory  
Roshanak Kalantari

Service SOPs: Asbestos PLM (EPA 40CFR App E to Sub E of Part 763 & EPA METHOD 600/R-93-116, SOP EM-AS-S-1267)  
NVLAP Lab Code 200945-0

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Client: TRUST Environmental Solutions  
C/O: Lab Results  
Re: 10834; Goleta Valley Library, 500 North  
Fairview Ave, Goleta, CA 93117

Date of Sampling: 11-18-2024  
Date of Receipt: 11-18-2024  
Date of Report: 11-18-2024

**ASBESTOS PLM REPORT**

**Total Samples Submitted:** 6  
**Total Samples Analyzed:** 6  
**Total Samples with Layer Asbestos Content > 1%:** 0

**Location: A-01, Main entry- South caulking**

Lab ID-Version‡: 19074911-1

Sample Layers	Asbestos Content
Black Caulk	ND
Sample Composite Homogeneity:	Good

**Location: A-02, Main entry- South caulking**

Lab ID-Version‡: 19074912-1

Sample Layers	Asbestos Content
Black Caulk	ND
Sample Composite Homogeneity:	Good

**Location: A-03, Main entry- South caulking**

Lab ID-Version‡: 19074913-1

Sample Layers	Asbestos Content
Black Caulk	ND
Sample Composite Homogeneity:	Good

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Date of Report: 11-18-2024

## ASBESTOS PLM REPORT

### Location: B-01, Main entry- West caulking

Lab ID-Version‡: 19074914-1

Sample Layers	Asbestos Content
Gray Caulk	ND
Sample Composite Homogeneity:	Good

### Location: B-02, Multi-purpose room- entry caulking

Lab ID-Version‡: 19074915-1

Sample Layers	Asbestos Content
Gray Caulk	ND
Sample Composite Homogeneity:	Good

### Location: B-03, Staff lounge- entry caulking

Lab ID-Version‡: 19074916-1

Sample Layers	Asbestos Content
Gray Caulk	ND
Sample Composite Homogeneity:	Good

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Date of Sampling: 11-18-2024  
Date of Receipt: 11-18-2024  
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## **ASBESTOS PLM REPORT**

### **PROJECT ANALYST AND SIGNATORY REPORT**

#### **Project Analyst**



**Analyst:** Buapha Laophio

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**ASBESTOS & LEAD CHAIN OF CUSTODY RECORD**

TRUST Assignment #: 10418

TAT Requested: ☒ 3HR ☐ 24HR ☐ Other

Client Name: Jeffrey Miller Architecture & Design  
Site Name: Goleta Valley Library  
Site Address: 500 North Fairview Avenue, Goleta, CA 93117

Type of Loss: Remodel Sample Count (Specify Type) \_\_\_\_\_  
Analysis Requested: ☒ PLM ☐ TEM (Wipe) ☐ TEM (MV) ☐ PCM  
☐ Lead Paint Chip ☐ Other

Sample ID	Collection Location	Material Type	F	NF	Condition	Total (Vol./Size)	Additional Notes (Color, P5, etc.)
A-01	Story Room - Ceiling	Acoustic Tiles 2x2	✓		N.D.	120 SF	
A-02	↓	↓	✓		↓	↓	
A-03	↓	↓	✓		↓	↓	
B-01	Vestibule - Ceiling	Acoustic Tiles 1x1	✓		N.D.	3500	
B-02	Kitchen	↓	✓		↓	↓	
B-03	Audio Visual Room	↓	✓		↓	↓	
B-04	Hallway	↓	✓		↓	↓	
B-05	Men's Restroom	↓	✓		↓	↓	
C-01	Kitchen - walls	Plaster	✓	✓	N.D.	1000 SF	
C-02	Audio Visual	↓	✓	✓	↓	↓	
C-03	Storage	↓	✓	✓	↓	↓	
C-04	Multi Purpose Room	↓	✓	✓	↓	↓	
C-05	↓	↓	✓	✓	↓	↓	
D-01	Office - walls	DJC	✓	✓	N.D.	1000 SF	
D-02	Conference Room	↓	✓	✓	↓	↓	
D-03	Staff Lounge	↓	✓	✓	↓	↓	
D-04	Mech Room	↓	✓	✓	↓	↓	
D-05	Janitor Closet	↓	✓	✓	↓	↓	

Date & Time: 10/21/24  
Company Name: TRUST Environmental Solutions  
Sampling Technician (Print): Tara Steiner  
Sampling Technician (Sign): [Signature]

Date & Time: 8:00 AM  
Company Name: TRUST Environmental Solutions  
Laboratory Recipient (Print): OCT 22 2024  
Laboratory Recipient (Sign): [Signature] Raymond Dalton

Page 1 of 1



003824199

ASBESTOS & LEAD CHAIN OF CUSTODY RECORD

TRUST Assignment #: 10418

TAT Requested: ☒ 3HR ☐ 24HR ☐ Other

Client Name: Jeffrey Miller Architecture & Design

Type of Loss: Remodel

Sample Count (Specify Type) 27 am / 31 pm

Site Name: Galea Valley Library

Analysis Requested: ☒ PLM ☐ TEM (Wipe) ☐ TEM (MV) ☐ PCM

Site Address: 500 W. Fairview Ave., Galea, CA 93117

☐ Lead Paint Chip ☐ Other

Sample ID	Collection Location	Material Type	F	NF	Condition	Total (Vol./Size)	Additional Notes (Color, PS, etc.)
E-01	Kitchen	Orange Cove Base w/glac		✓	N.D.	20 SF	
E-02	↓	↓		✓	↓	↓	
E-03	↓	↓		✓	↓	↓	
F-01	Audio Visual Room	Brown Cove Base w/glac		✓	N.D.	40 SF	
F-02	↓	↓		✓	↓	↓	
F-03	↓	↓		✓	↓	↓	
G-01	Audio Visual Room	9x9 tile w/mosaic		✓	N.D.	150 SF	
G-02	↓	↓		✓	↓	↓	
G-03	Kitchen			✓			
LP-01	Vestibule - walls	Plaster			2		Beige <0.1
LP-02	↓ - B.B.	Wood			↓		Brown ↓ 1.6
LP-03	↓ - Flooring	Ceramic			↓		Beige <0.1
LP-04	Multi-Purpose Room - walls	Wallpaper			↓		Brown ↓
LP-05	↓ - B.B.	Wood			↓		White ↓
LP-06	↓ - Chair Rail	↓			↓		Varnish ↓
LP-07	Kitchen - walls	Plaster			↓		White ↓
LP-08	↓ - Cabinets	Wood			↓		
LP-09	Audio Visual Room - walls	Plaster			↓		

Date & Time: 10/21/24 8:00

Company Name: TRUST Environmental Solutions

Sampling Technician (Print): Tara Steiner

Sampling Technician (Sign): [Signature]

Date & Time: \_\_\_\_\_

Company Name: \_\_\_\_\_

Laboratory Recipient (Print): \_\_\_\_\_

Laboratory Recipient (Sign): Received By

Page 2 of 4



**ASBESTOS & LEAD CHAIN OF CUSTODY RECORD**

**TRUST Assignment #:** 10418

**TAT Requested:** ☒ 8HR ☐ 24HR ☐ Other

**Client Name:** Jeffrey Miller Architecture & Design

**Type of Loss:** Remodel **Sample Count (Specify Type):** 27 min / 3 x EE

**Site Name:** Golden Valley Library

**Analysis Requested:** ☒ PLM ☐ TEM (Wipe) ☐ TEM (MV) ☐ PCM

**Site Address:** 500 N. Fairview Ave, Glendale, CA 93017

☐ Lead Paint Chip ☐ Other

Sample ID	Collection Location	Material Type	F	NF	Condition	Total (Vol./Size)	Additional Notes (Color, P5, etc.)
LP-10	Women's Restroom - walls	Ceramic			3		Tan 5.0
LP-11	↓ - Flooring	↓					Multi: <0.1
LP-12	Men's Restroom - walls	↓					Tan 7.5
LP-13	↓ - Flooring	↓					Multi: <0.1
LP-14	Children's Reading - walls	Drywall					Cream
LP-15	↓ - B.B.	Wood					Brown
LP-16	Storage Room - walls	Drywall					White
LP-17	Teen Corner	↓					Cream
LP-18	Office	↓					↓
LP-19	Staff work Room -	↓					White
LP-20	↓ -	Brick					↓
LP-21	Conference Room -	Drywall					Cream
LP-22	Corridor	↓					↓
LP-23	Staff Lounge	↓					↓
LP-24	Women's Staff Rm. - walls	Ceramic					Tan 8.2
LP-25	↓ - Flooring	↓					Multi: <0.1
LP-26	Men's Staff Rm. - walls	↓					Tan 9.9
LP-27	↓ - Flooring	↓					Multi: <0.1

**Date & Time:** 10/21/21 8:00

**Company Name:** TRUST Environmental Solutions

**Sampling Technician (Print):** Tara Steiner

**Sampling Technician (Sign):** Relinquished By

**Date & Time:**

**Company Name:**

**Laboratory Recipient (Print):**

**Laboratory Recipient (Sign):** Received By





Please send all results to



Environmental  
Solutions

Results Begin With TRUST

317 W Ventura Blvd., #1067, Ca  
(805) 72-TRUST | www.TRUSTenv.com | Test



003855837

# ASBESTOS & LEAD CHAIN OF CUSTODY RECORD

TRUST Assignment #: 10834

TAT Requested: ☒ 3HR ☐ 24HR ☐ Other

Client Name: Jeffrey Miller Architecture & Design

Type of Loss: Renovation

Sample Count (Specify Type)

6 am 10 KRF

Site Name: Goleta Valley Library

Analysis Requested:

☐ PLM ☐ TEM (Wipe) ☐ TEM (MV) ☐ PCM

Site Address: 500 North Fairview Avenue, Goleta, CA 93117

☐ Lead Paint Chip ☐ Other

Sample ID	Collection Location	Material Type	F	NF	Condition	Total (Vol./Size)	Additional Notes (Color, P5, etc.)
A-01	Main Entry - South	<del>Plaster</del> Caulking		✓	N.D.	10 SF	Black
A-02	↓	↓		✓	↓	↓	↓
A-03	↓	↓		✓	↓	↓	↓
B-01	Main Entry - West	Caulking		✓	N.D.	10 SF	Beige
B-02	Multi-Purpose Room - Entry	↓		✓	↓	↓	↓
B-03	Staff Lounge -	↓		✓	↓	↓	↓
LP-01	Main Entry - South - Fascia	Wood			I		Yellow 0.3
LP-02	↓ - Flooring	Ceramic			↓		Brown 1.8
LP-03	↓ - Hand Rail	Metal			↓		Yellow 3.0
LP-04	↓ - West - Fascia	Wood			↓		↓ 40.1
LP-05	↓ - Flooring	Ceramic			↓		Brown 1.8
LP-06	Staff Room Entry - Fascia	Wood			↓		Yellow 40.1
LP-07	↓ - Door	↓			↓		White
LP-08	Break Room Entry - Fascia	↓			↓		Yellow
LP-09	Main Entry -	↓			↓		Orange
LP-10	North West Window - Fascia	↓			↓		Yellow

Date & Time:

11/18/24

Company Name: TRUST Environmental Solutions

Sampling Technician (Print): Tara Steiner

Sampling Technician (Sign):

Relinquished By

Date & Time:

Company Name:

Laboratory Recipient (Print):

Laboratory Recipient (Sign):

NOV 18 2024

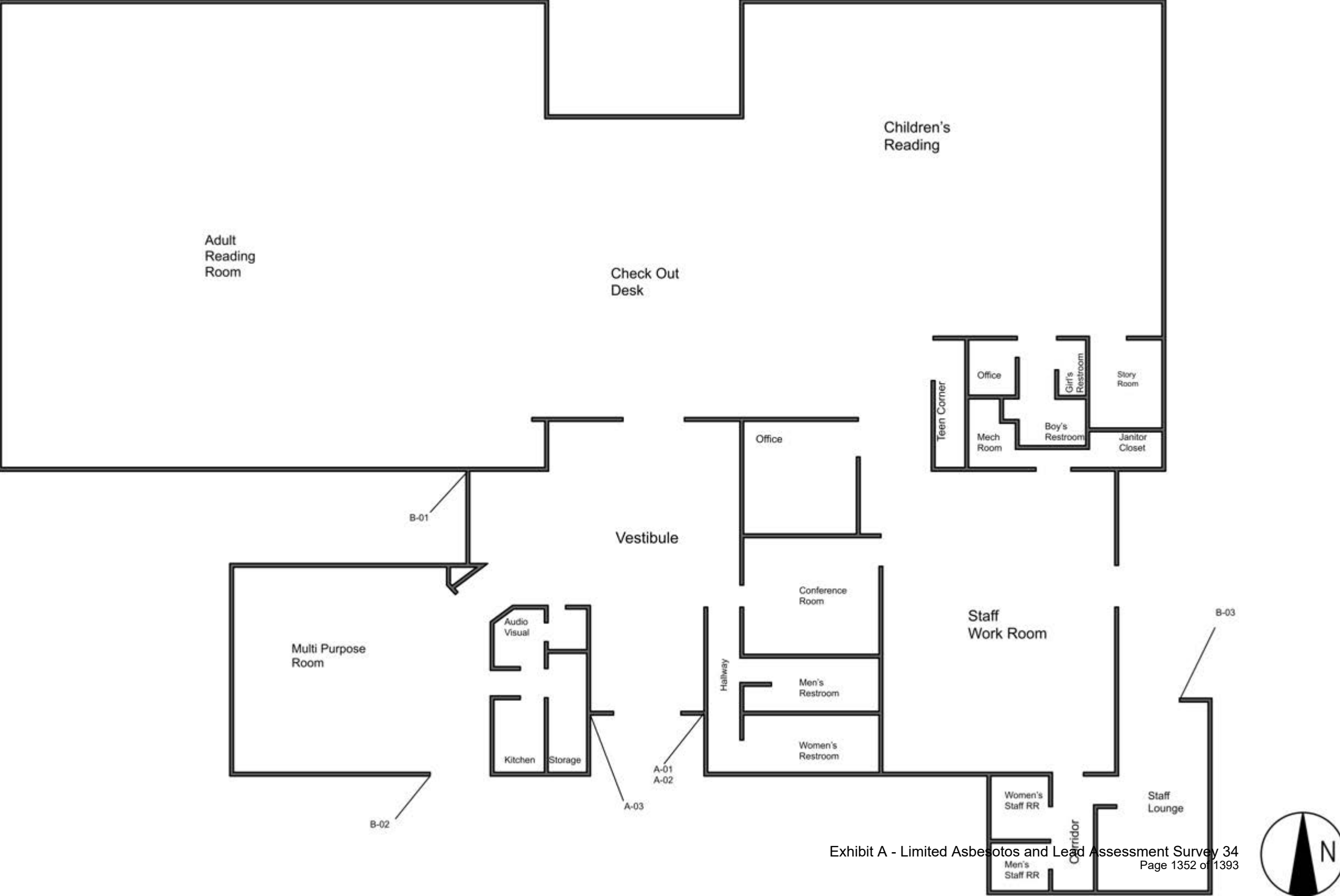
2:00p

Raymond Dalton

Received By

Page 1 of 1

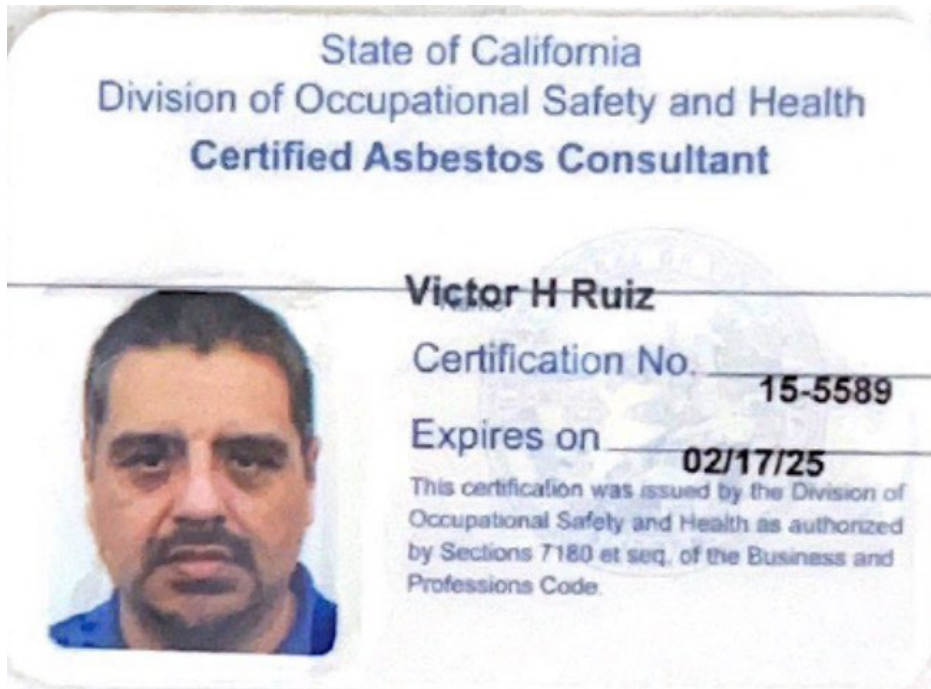
## APPENDIX B – SITE DIAGRAM



## APPENDIX C – CERTIFICATIONS



		STATE OF CALIFORNIA DEPARTMENT OF PUBLIC HEALTH			
<b>LEAD-RELATED CONSTRUCTION CERTIFICATE</b>					
INDIVIDUAL:	CERTIFICATE TYPE:	NUMBER:	EXPIRATION DATE:		
	Lead Sampling Technician	LRC-00003549	1/11/2025		
Tara Steiner					
<small>Disclaimer: This document alone should not be relied upon to confirm certification status. Compare the individual's photo and name to another valid form of government issued photo identification. Verify the individual's certification status by searching for Lead-Related Construction Professionals at <a href="http://www.cdph.ca.gov/programs/clppb">www.cdph.ca.gov/programs/clppb</a> or calling (800) 597-LEAD</small>					



STATE OF CALIFORNIA  
DEPARTMENT OF PUBLIC HEALTH



## LEAD-RELATED CONSTRUCTION CERTIFICATE

INDIVIDUAL:



Victor Ruiz

CERTIFICATE TYPE:

Lead Inspector/Assessor

NUMBER:

LRC-00011686

EXPIRATION DATE:

9/1/2025

Disclaimer: This document alone should not be relied upon to confirm certification status. Compare the individual's photo and name to another valid form of government issued photo identification. Verify the individual's certification status by searching for Lead-Related Construction Professionals at [www.cdph.ca.gov/programs/clppb](http://www.cdph.ca.gov/programs/clppb) or calling (800) 597-LEAD



# Limited Asbestos Assessment Survey

## Survey Location:

Goleta Valley Library  
500 North Fairview Avenue  
Goleta, CA 93117

## Report Prepared for:

Jeffrey Miller Architecture and Design  
Attn: Jeffrey Miller  
516 North Sepulveda Boulevard  
Manhattan Beach, CA 90266  
jm@jmadstudio.com

Survey Date: October 2, 2025  
Report Date: October 4, 2025





TRUST Assignment Number: WO-15846

October 4, 2025

Jeffrey Miller Architecture and Design  
Attn: Jeffrey Miller  
516 North Sepulveda Boulevard  
Manhattan Beach, CA 90266  
jm@jmadstudio.com

## Limited Asbestos Assessment Survey

### Section I: Site Characterization and Background Information

On October 2, 2025, TRUST Environmental Solutions (TRUST Environmental) conducted a Limited Asbestos Survey of the Goleta Valley Library Property located at 500 North Fairview Avenue Goleta, CA 93117. This survey was completed at the request of Jeffrey Miller Architecture and Design and was completed by: Certified Site Surveillance Technician, Craig Toth (CSST# 13-5072), under the direction of Certified Asbestos Consultant, Victor Ruiz (CAC# 15-5589) who are employees of TRUST Environmental Solutions located at 317 W. Ventura Blvd., #1067, Camarillo, California 93010. Asbestos samples were hand delivered to:

Eurofins Pomona (NVLAP; 600282-0) located at 931 Corporate Center Drive, Pomona, CA 91768. EMLab Pomona can be reached at (866) 465-6653 or EBET.customerservice@et.eurofinsus.com.

Prior to inspection, TRUST Environmental was informed of a demolition, affecting the interior. No obvious structural or fire damages were observed.

### Section II: Results Summary

RESULT: ☒ Asbestos was Detected  
☐ Asbestos was Not Detected

Asbestos **was detected** within the White Joint Compound.

A total of 8 asbestos PLM bulk samples were collected. 8 samples were analyzed.

\*TRUST Environmental includes the first three (3) layers of material analyzed. Each additional layer analyzed after three (3) is charged as one (1) additional sample. Per AQMD Rule 1403 and EPA Test Method (EPA/600/R 93/116) Section 2.1.5.2, for materials composed of distinct layers or two or more distinct building materials, each layer or distinct building material should be treated as a discrete sample. TRUST Environmental is required to analyze each layer of material until positive material is detected or until all layers are analyzed and no asbestos is detected.

Please see Tables I below for a summary of the survey results followed by supplemental information including recommendations and testing methodologies.

## Table I: Summary of Asbestos PLM Sample Results

Air Quality District: Santa Barbara County Air Pollution Control District

Sample ID	Area Tested	Material Sampled	Result	Quantity	Friability	Condition	P5 Req
1	Office South	White Joint Compound 1	2%CH	300sf*	NF	G	N
1	Office South	White Joint Compound 2	2%CH	300sf*	NF	G	N
2	Office South	White Joint Compound	2%CH	300sf*	NF	G	N
2	Office South	White Drywall	NAD (h)	300sf*	NF	G	N
3	Office	White Joint Compound	2%CH	300sf*	NF	G	N
3	Office	White Drywall	NAD (h)	300sf*	NF	G	N
4	Under Grey Carpet	Yellow Mastic	NAD	2500sf*	NF	G	N
5	Under Grey Carpet	Yellow Mastic	NAD	2500sf*	NF	G	N
6	Under Grey Carpet	Yellow Mastic	NAD	2500sf*	NF	G	N
7	Under Light Grey	Yellow Mastic	NAD	100sf*	NF	G	N
8	Under Brown Carpet	Yellow Mastic	NAD	200sf*	NF	G	N

### Reference Legend:

NAD - No Asbestos Detected, CH - Chrysotile Asbestos

NAD (h) - No Asbestos Detected but material is still considered asbestos containing due to being part of a homogenous area.

NAD (t) - No Asbestos Detected but material is still considered to have trace level asbestos due to being part of a homogenous area.

sf\* - Estimated Square Feet

F - Friable | NF - Non-Friable

G - Good, D - Damaged, SD - Significantly Damaged

SCAQMD - South Coast Air Quality District, AVAQMD - Antelope Valley Air Quality District, VCAPCD: Ventura County Air Pollution Control District

### Section III: Recommendations

#### Asbestos Recommendations:

- ☐ NAD - Asbestos was not detected within the sampled area. No further action is required.
- ☐  $\leq 0.1\%$  CH - This material was further analyzed by point count and the asbestos found was determined to be at trace level. The contractor must comply with Cal/OSHA asbestos exposure monitoring. Although the material is below quantifiable limits of asbestos, contracted employees should be instructed on wet methods of removal, HEPA vacuuming, prompt clean up, and the prevention of raising dust while work is performed.
- ☐  $< 1\%$  CH - Asbestos was detected in trace amounts in the sampled area. This material may be further analyzed by 1000-point count at the request of the client to determine the method of removal that must be used. If not further analyzed or determined to be  $> 0.1\%$  and  $< 1\%$  CH by point count, this material must be treated as asbestos containing material. Any work that will disturb asbestos containing materials or asbestos containing construction materials must be completed by a California state licensed Asbestos Abatement Contractor. Abatement activities must be performed by asbestos trained personnel using proper PPE and controls. The abatement contractor must comply with all local, state, and federal regulations governing the removal and/or disturbance of Asbestos Containing Materials.
- ☒ Greater than 1% CH - Asbestos was detected in amounts greater than 1% CH in the sampled area. This material must be treated as asbestos containing material. Any work that will disturb asbestos containing materials or asbestos containing construction materials must be completed by a California state licensed Asbestos Abatement Contractor. Abatement activities must be performed by asbestos trained personnel using proper PPE and controls. The abatement contractor must comply with all local, state, and federal regulations governing the removal and/or disturbance of Asbestos Containing Materials.

## Section IV: Purpose and Methodologies

The purpose of this survey assessment was to identify Asbestos Containing Materials (ACM) that may be impacted by planned repair, remodel, renovation and/or demolition activities at the survey location. TRUST Environmental first conducted a visual inspection of the survey location to identify and assess the condition of materials to be sampled.

Bulk material samples of suspected asbestos containing material were collected, categorized into homogenous groupings, labeled a unique sample number for each sample, and placed into a sealed container. Asbestos samples were analyzed via Polarized Light Microscopy (PLM) for asbestos content by an accredited laboratory listed below. Principles described in the EPA 600 method were used in the preparation and analysis of the bulk samples. US EPA government regulation requires that a limited number of samples be collected from each identified homogenous area. If one sample in a homogenous area is determined to be asbestos containing, the entire homogenous area must be considered asbestos containing, even if no asbestos was detected in any other samples within the homogenous area. No destructive sampling was conducted. As such, any inaccessible areas that would require destructive sampling were not inspected or sampled. All areas that renovation or demolition plans will impact must be inspected or sampled. Asbestos bulk samples were delivered to and analyzed via PLM by an accredited laboratory.

The specific number of samples collected was determined by using the methods required by the Federal AHERA regulations (40 CFR, Part 763.86) as noted below:

1) For Surfacing Material:

1,000 ft<sup>2</sup> or less - collect 3 samples

1,001 to 5,000 ft<sup>2</sup> - collect 5 samples

5,001 ft<sup>2</sup> or greater - collect 7 samples

2) For Thermal System Insulation:

"In a randomly distributed manner" - collect 3 samples

6 linear feet of patching or less - collect 1 sample

cementitious pipe fittings - "In a manner sufficient to determine"

3) For all Miscellaneous Material:

Collect samples "In a manner sufficient to determine whether material is ACM (asbestos containing material) or not ACM."

## Section V: Limitations

TRUST Environmental Solutions presents this report and makes the above recommendations based on limitations of the analytical method, along with independent research and industry consensus. TRUST Environmental and representatives of TRUST Environmental are not licensed as Medical Professionals and can make no medical diagnoses. TRUST Environmental was limited to the conditions and observations present only on the day of inspection. Environmental testing is an imperfect science and Asbestos Surveying is limited. In addition, reports may contain inaccuracies. TRUST Environmental may revise the above content of this report at any time when presented with new information. Any reference to quantities within this report are estimates and are not actual. TRUST Environmental was limited to standard practices, the scope of services, parameters of the analytical method used, and conditions present at the time of inspection. In addition, TRUST Environmental was limited to the following:

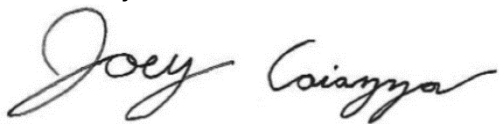
- Additional suspect materials could be present between walls, in voids, or in other concealed areas. Caution should be exercised regarding these areas. In the event that additional materials are found which have not been sampled, TRUST Environmental recommends that work stops until those materials can be sampled for asbestos content.
- Limitations due to sampling and laboratory analysis constraints can hinder the investigation. TRUST Environmental 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 TRUST Environmental's personnel as unsafe to access, are excluded from the scope of work.
- TRUST Environmental does not guarantee or warrant that the facility or workplace is safe; nor does TRUST Environmental's involvement in this property relieve the Client, building owner/operator or tenant of any continuing responsibility of providing a safe facility or living space.
- TRUST Environmental 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 TRUST Environmental's work.

Thank you for choosing TRUST Environmental Solutions. Please contact us at (805) 72-TRUST or TestIt@TRUSTenv.com for any additional testing needs. Please contact the Reports Department at GetResults@TRUSTenv.com for any questions or requested revisions regarding this report and we would be happy to assist you.

Sincerely,

TRUST Environmental Solutions, Inc.

Written By:



Joey Caiazza  
Technical Reports Dept Manager  
[GetResults@TRUSTenv.com](mailto:GetResults@TRUSTenv.com)  
(805) 72-TRUST  
TRUST Environmental Solutions  
317 W. Ventura Blvd., 1067  
Camarillo, California 93010

Reviewed By:



Victor Ruiz  
Certified Asbestos Consultant (15-5589)  
and LRC (00011686)  
Victor.Ruiz@TrustEnv.com  
(805) 750-6342  
TRUST Environmental Solutions  
317 W. Ventura Blvd., 1067  
Camarillo, California 93010

## Section VI: Appendices

Please see below for any relevant analytical results, site diagrams, and certifications regarding the above project.

## APPENDIX A – ANALYTICAL RESULTS AND CHAIN OF CUSTODY



Report for:

**Lab Results**  
**TRUST Environmental Solutions**  
317 Ventura Blvd.  
#1067  
Camarillo, CA 93010

---

Regarding: Eurofins Built Environment Testing West, LLC  
Project: 15846; 500 N Fairview Ave, Goleta 93117  
EML ID: 4254817

Approved by:

Dates of Analysis:  
Asbestos PLM: 10-03-2025



Regional Laboratory Director  
Carlos Rivadeneyra

Service SOPs: Asbestos PLM (EPA 40CFR App E to Sub E of Part 763 & EPA METHOD 600/R-93-116, SOP EB-AS-S-1267)  
NVLAP Lab Code 600282-0

---

All samples were received in acceptable condition unless noted in the Report Comments portion in the body of the report. The results relate only to the samples as received and tested. The results include an inherent uncertainty of measurement associated with estimating percentages by polarized light microscopy. Measurement uncertainty data for sample results with >1% asbestos concentration can be provided when requested.

Eurofins Built Environment Testing West, LLC ("the Company"), a member of the Eurofins Built Environment Testing group of companies, shall have no liability to the client or the client's customer with respect to decisions or recommendations made, actions taken or courses of conduct implemented by either the client or the client's customer as a result of or based upon the Test Results. In no event shall the Company be liable to the client with respect to the Test Results except for the Company's own willful misconduct or gross negligence nor shall the Company be liable for incidental or consequential damages or lost profits or revenues to the fullest extent such liability may be disclaimed by law, even if the Company has been advised of the possibility of such damages, lost profits or lost revenues. In no event shall the Company's liability with respect to the Test Results exceed the amount paid to the Company by the client therefor.



Client: TRUST Environmental Solutions  
C/O: Lab Results  
Re: 15846; 500 N Fairview Ave, Goleta 93117

Date of Sampling: 10-02-2025  
Date of Receipt: 10-03-2025  
Date of Report: 10-03-2025

## ASBESTOS PLM REPORT

**Total Samples Submitted:** 8

**Total Samples Analyzed:** 8

**Total Samples with Layer Asbestos Content > 1%:** 3

### Location: 1, [Drywall] Office South Wall

Lab ID-Version‡: 21284044-1

Sample Layers	Asbestos Content
White Joint Compound 1	2% Chrysotile
White Joint Compound 2	2% Chrysotile
<b>Composite Non-Asbestos Content:</b>	5% Cellulose
<b>Sample Composite Homogeneity:</b>	Good

### Location: 2, [Drywall] Office South Wall

Lab ID-Version‡: 21284045-1

Sample Layers	Asbestos Content
White Joint Compound	2% Chrysotile
White Drywall	ND
<b>Composite Non-Asbestos Content:</b>	5% Cellulose 4% Glass Fibers
<b>Sample Composite Homogeneity:</b>	Good

### Location: 3, [Drywall] Office Wall

Lab ID-Version‡: 21284046-1

Sample Layers	Asbestos Content
White Joint Compound	2% Chrysotile
White Drywall	ND
<b>Composite Non-Asbestos Content:</b>	5% Cellulose 4% Glass Fibers
<b>Sample Composite Homogeneity:</b>	Good

### Location: 4, [Yellow Mastic] Under Grey Carpet

Lab ID-Version‡: 21284047-1

Sample Layers	Asbestos Content
Yellow Mastic	ND
<b>Sample Composite Homogeneity:</b>	Good

The test report shall not be reproduced except in full, without written approval of the laboratory. The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government. The Company reserves the right to dispose of all samples after a period of thirty (30) days, according to all state and federal guidelines, unless otherwise specified.

All components not quantified as asbestos content and non-asbestos content are considered to be non-fibrous matrix components. Matrix components may include, but are not limited to, gypsum, paint, silicate minerals, vinyl, binder, calcium carbonate, tar, and foam.

Inhomogeneous samples are separated into homogeneous subsamples and analyzed individually. ND means no fibers were detected. When detected, the minimum detection and reporting limit is less than 1% unless point counting is performed. Floor tile samples may contain large amounts of interference material and it is recommended that the sample be analyzed by gravimetric point count analysis to lower the detection limit and to aid in asbestos identification.

‡ A "Version" indicated by "-x" after the Lab ID# with a value greater than 1 indicates a sample with amended data. The revision number is reflected by the value of "x".

Client: TRUST Environmental Solutions  
C/O: Lab Results  
Re: 15846; 500 N Fairview Ave, Goleta 93117

Date of Sampling: 10-02-2025  
Date of Receipt: 10-03-2025  
Date of Report: 10-03-2025

## ASBESTOS PLM REPORT

### Location: 5, [Yellow Mastic] Under Grey Carpet

Lab ID-Version‡: 21284048-1

Sample Layers	Asbestos Content
Yellow Mastic	ND
Sample Composite Homogeneity: Good	

### Location: 6, [Yellow Mastic] Under Grey Carpet

Lab ID-Version‡: 21284049-1

Sample Layers	Asbestos Content
Yellow Mastic	ND
Sample Composite Homogeneity: Good	

### Location: 7, [Yellow Mastic] Under Light Grey Carpet

Lab ID-Version‡: 21284050-1

Sample Layers	Asbestos Content
Yellow Mastic	ND
Sample Composite Homogeneity: Good	

### Location: 8, [Yellow Mastic] Under Brown Carpet

Lab ID-Version‡: 21284051-1

Sample Layers	Asbestos Content
Yellow Mastic	ND
Sample Composite Homogeneity: Good	

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All components not quantified as asbestos content and non-asbestos content are considered to be non-fibrous matrix components. Matrix components may include, but are not limited to, gypsum, paint, silicate minerals, vinyl, binder, calcium carbonate, tar, and foam.

Inhomogeneous samples are separated into homogeneous subsamples and analyzed individually. ND means no fibers were detected. When detected, the minimum detection and reporting limit is less than 1% unless point counting is performed. Floor tile samples may contain large amounts of interference material and it is recommended that the sample be analyzed by gravimetric point count analysis to lower the detection limit and to aid in asbestos identification.

‡ A "Version" indicated by "-x" after the Lab ID# with a value greater than 1 indicates a sample with amended data. The revision number is reflected by the value of "x".

Client: TRUST Environmental Solutions  
C/O: Lab Results  
Re: 15846; 500 N Fairview Ave, Goleta 93117

Date of Sampling: 10-02-2025  
Date of Receipt: 10-03-2025  
Date of Report: 10-03-2025

**ASBESTOS PLM REPORT**

**PROJECT ANALYST AND SIGNATORY REPORT**

---

**Project Analyst**



**Analyst:** Vivian Le

The test report shall not be reproduced except in full, without written approval of the laboratory. The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government. The Company reserves the right to dispose of all samples after a period of thirty (30) days, according to all state and federal guidelines, unless otherwise specified.

‡ A "Version" indicated by "-x" after the Lab ID# with a value greater than 1 indicates a sample with amended data. The revision number is reflected by the value of "x".



Results Begin with TRUST

ASBESTOS & LEAD CHAIN OF CUSTODY RECORD

317 W Ventura Blvd., #1067  
(805) 72-TRUST | www.TRUSTenv.com



TRUST Assignment #: 15846 Survey Type: ☒ Lim ☐ Comp TAT Requested: ☒ 3HR ☐ 24HR ☐ Other

Client Name: Goleta Valley Library Type of Loss: Demo Sample Count (Specify Type) 8  
Site Name: Analysis Requested: ☒ PML ☐ TEM (Wipe) ☐ TEM (MV) ☐ PCM

Site Address: 500 N. Fairview Ave., Goleta 93117 ☐ Lead Paint Chip ☐ Other

Sample ID	Collection Location	Material Type	F	NF	Condition	Total (Vol./Size)	Additional Notes (Color, P5, etc.)
1	Office S. Wall	Drywall	/	/	UD	300	
2	Office S. Wall		/	/	I	I	
3	Office Wall		/	/	UP	2500	
4	Under Grey Carpet	Yellow Moist	/	/	I	I	
5			/	/	I	100	
6	Under Light Grey Carpet		/	/	I	200	
7			/	/	I		
8	Under Brown Carpet		/	/	I		

Date & Time: 10-2-25 10:20P  
Company Name: TRUST Environmental Solutions  
Sampling Technician (Print): Graig TOTH  
Sampling Technician (Sign): [Signature]

Date & Time: 10/3/25 10:40A  
Company Name: EBET Pavers  
Laboratory Recipient (Print): Corner Light  
Laboratory Recipient (Sign): [Signature]



Results Begin with TRUST

ASBESTOS & LEAD CHAIN OF CUSTODY RECORD

317 W Ventura Blvd., #1067  
(805) 72-TRUST | www.TRUSTenv.com



TRUST Assignment #: 15846 Survey Type: ☒ Lim ☐ Comp TAT Requested: ☒ 3HR ☐ 24HR ☐ Other

Client Name: Goleta Valley Library Type of Loss: DMO Sample Count (Specify Type) 8  
Site Name: Analysis Requested: ☒ PML ☐ TEM (Wipe) ☐ TEM (MV) ☐ PCM

Site Address: 500 N. Fairview Ave., Goleta 93117 ☐ Lead Paint Chip ☐ Other

Sample ID	Collection Location	Material Type	F	NF	Condition	Total (Vol./Size)	Additional Notes (Color, P5, etc.)
1	Office S. Wall	Drywall	/	/	UD	300	
2	Office S. Wall		/	/	I	I	
3	Office Wall		/	/	UP	2500	
4	Under Grey Carpet	Yellow Moisture	/	/	I	I	
5			/	/	I	100	
6	Under Light Grey Carpet		/	/	I	200	
7			/	/	I		
8	Under Brown Carpet		/	/	I		

Date & Time: 10-2-25 10:20P  
Company Name: TRUST Environmental Solutions  
Sampling Technician (Print): Graig TOTH  
Sampling Technician (Sign): [Signature]

Date & Time: 10/3/25 10:40A  
Company Name: EBET Pavers  
Laboratory Recipient (Print): Corner Light  
Laboratory Recipient (Sign): [Signature]

## APPENDIX B – SITE DIAGRAM



TRUST Environmental  
Solutions

Always Safe. With TRUST

ENVIRONMENTAL | INDOOR AIR QUALITY TESTING  
Tel (805) 72-TRUST | www.TRUSTenv.com

### SITE DIAGRAM

TRUST Assignment #: 15846

Client Name: Galea Valley Library

Site Name: Basins

Site Address: 500 North Fairview

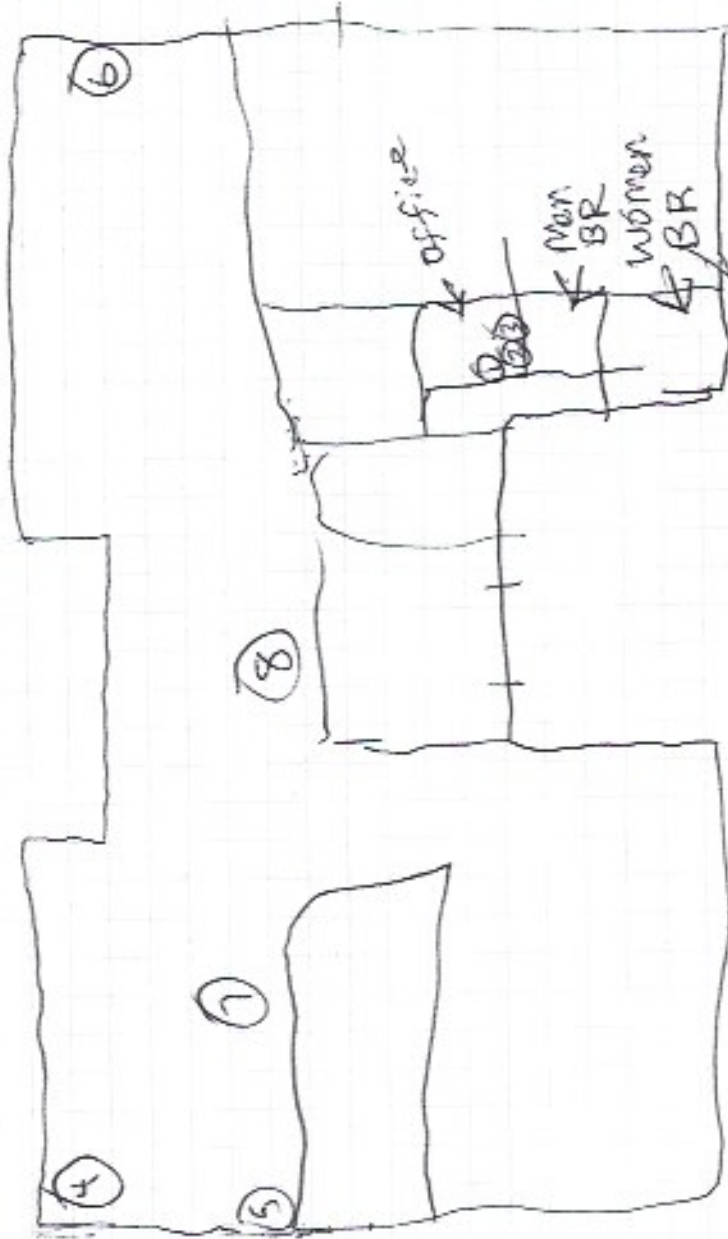
Assigned Technician: Craig TOTH

Testing Type: Basins

Survey Type: Full

Revisit: ☐ Yes ☐ No

P5: ☐ Yes ☐ No ☐ N/A



## APPENDIX C – CERTIFICATIONS





STATE OF CALIFORNIA  
DEPARTMENT OF PUBLIC HEALTH



## LEAD-RELATED CONSTRUCTION CERTIFICATE

INDIVIDUAL:



Craig Toth

CERTIFICATE TYPE:

Lead Inspector/Assessor

NUMBER:

LRC-00011060

EXPIRATION DATE:

4/4/2026

Disclaimer: This document alone should not be relied upon to confirm certification status. Compare the individual's photo and name to another valid form of government issued photo identification. Verify the individual's certification status by searching for Lead-Related Construction Professionals at [www.cdph.ca.gov/programs/clppb](http://www.cdph.ca.gov/programs/clppb) or calling (800) 597-LEAD



INDIVIDUAL:		CERTIFICATE TYPE:	NUMBER:	EXPIRATION DATE:
	Victor Ruiz	Lead Inspector/Assessor	LRC-00011686	9/1/2025

Disclaimer: This document alone should not be relied upon to confirm certification status. Compare the individual's photo and name to another valid form of government issued photo identification. Verify the individual's certification status by searching for Lead-Related Construction Professionals at [www.cdph.ca.gov/programs/clppb](http://www.cdph.ca.gov/programs/clppb) or calling (800) 597-LEAD

**GOLETA WATER DISTRICT  
FIRE HYDRANT FLOW FORM**

Revised 7-15-11

Flow Date: 10.30.24 Time: 9:00 am/pm GWD Job No. \_\_\_\_\_  
Location: 595 N. FAIRVIEW  
Flowed by: JB Witness: EH  
Purpose of Flow: Customer  
Main size: 8" STL Nozzle size: 4" Pressure Zone: 230  
If pumps or other facilities impact flow rates, indicate facilities operating. NA

Flow Hydrant No: 834  
Flow Hydrant Elevation: 60 feet  
Flow Hydrant Initial Static Pressure: 72 psi  
Flow Rate at Flow Hydrant: 1750 gpm  
Residual Pressure at Flow Hydrant: 49 psi (during test)  
GPS: X: 34.448355 Y: 119.830760 Grid Page: Q20  
Shutoff valve location: 27' EAST OF FH

Residual Hydrant No: 280  
Residual Hydrant Elevation: 39 feet  
Residual Hydrant Initial Static Pressure: 80 psi  
Residual Pressure at Residual Hydrant: 76 psi (during test)  
GPS: X: 34.446514 Y: 119.830760 Grid Page: P20  
Shutoff valve location: 20 FT EAST OF FH

Operator Performing FH Flow: JB EH Date 10.30.24  
Chief Distribution System Operator: [Signature] Date 10/30/24  
Entered Into GIS: \_\_\_\_\_ Date \_\_\_\_\_

This information is provided as a convenience only and Goleta Water District is not certifying to the accuracy or completeness of such information. The user of this information will assume all responsibility for the deductions and conclusions made regarding Goleta Water District's water system, its pressures and flow capabilities. Confirmation of this information by re-testing can be arranged with Goleta Water District at the user's own expense. Goleta Water District will operate valves, hydrants and take all pressure readings.



Public Works Department

# Construction and Demolition Debris Recycling Program

## Waste Reduction and Recycling Plan Guidance Document

March 2019



## **Getting Started with your Construction and Demolition Debris Recycling Program and the Post Construction Waste Reduction & Recycling Summary Report (WRRS)**

### **Step 1 – Determine whether your project is subject to this requirement**

The following regulated projects must complete and submit a Certificate of Implementation and a Waste Reduction and Recycling Summary Report:

1. All Commercial additions or alterations;
2. All Residential additions or alterations that add floor space/increase size.
3. All Demolition of any structure requiring a permit.
4. All New Construction (pursuant to the California Green Building Code)

### **Step 2 – Complete a Certificate Of Implementation:**

- Submit to City for permit file.

### **Step 3 – Complete and submit a Post-Construction Waste Reduction & Recycling Summary Report (WRRS)**

- Submit the Post-Construction WRRS report to the City for review. Package to include WRRS form, weight tickets, etc.
- WRRS shall be submitted at least five (5) days prior to final inspection and issuance of certificate of occupancy or temporary certificate of occupancy.
- A final Certificate of Occupancy cannot be issued until these requirements have been satisfied.



**Certificate of Implementation**  
**City's Implementation of State Law:**  
Construction and Demolition (C&D) Debris Recycling Program  
State of California Green Building Code (CalGreen)

The California Green Building Code: Effective January 1, 2017, the 2016 CalGreen requires that all Commercial additions or alterations, all Residential additions or alterations that add floor space/increase size, all Demolition of any structure requiring a permit and all New Construction (pursuant to the California Green Building Code) are required to divert 65% of the construction materials generated during construction of the project. The City has therefore implemented a mandatory Construction and Demolition (C&D) Debris Recycling Program to divert at least 65% of these highly recoverable materials from the landfill in accordance with CalGreen. This Program shall as defined above.

\_\_\_\_\_  
Property Address

\_\_\_\_\_  
Project Number (e.g. CDP, APR, OC, Permit)

\_\_\_\_\_  
Owner/Developer Name

\_\_\_\_\_  
Phone#

E-mail address: \_\_\_\_\_

\_\_\_\_\_  
Proposed Solid Waste Hauler:

**\* A change in hauler is permitted as long as applicant notifies City in writing.**

**AFFIDAVIT OF PROJECT TYPE:** (check one or more)

- ☐ **The project involves new construction.**      ☐ **The project involves commercial addition/alteration.**  
☐ **The project involves demolition.**      ☐ **The project involves residential addition/alteration.**

For all projects: A Summary Report shall be submitted to the City detailing how a 65% or greater diversion **was met** to comply with CalGreen. Sign both the Affidavit and Certification below.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Printed Name

\_\_\_\_\_  
Date

☐ Property Owner/ Authorized Agent (circle which)

☐ Licensed Contractor, License No. \_\_\_\_\_

**CERTIFICATION OF IMPLEMENTATION: C&D DEBRIS RECYCLING PROGRAM**

This is to certify a C&D Recycling Program for the above-referenced address will be implemented to divert a minimum of 65% and a Summary Report (detailing how the diversion was met) shall be submitted to the City upon project completion, prior to obtaining a Certificate of Occupancy.

I declare that I have read and understand the requirements of the City's C&D Debris Recycling Program and that the foregoing is true and correct.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Printed Name

\_\_\_\_\_  
Date

☐ Property Owner/ Authorized Agent (circle which)

☐ Licensed Contractor, License No. \_\_\_\_\_



## Post-Construction Waste Reduction & Recycling Summary Report (WRRS)

Pursuant to the California Green Building Code this form must be completed for the following types of projects:

- All Commercial additions or alterations;
- All Residential additions or alterations that add floor space/increase size.
- All Demolition of any structure requiring a permit.
- All New Construction

NOTE: Completed WRRS Reports shall be submitted to the City of Goleta Public Counter 5 days prior to Final Inspection and issuance of Certificate of Occupancy or Temporary Certificate of Occupancy. If you have questions, please call: 805-961-7575.

Building Permit#: \_\_\_\_\_ Date: \_\_\_\_\_

Project Address (Include floor, suite, etc.): \_\_\_\_\_

Contact Name: \_\_\_\_\_ Title: \_\_\_\_\_

Company Name: \_\_\_\_\_

Contact Mailing Address: \_\_\_\_\_

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_

Email: \_\_\_\_\_

1. Type of Project: ☐ New Construction ☐ Addition/Alteration ☐ Demolition
2. Type of Building: ☐ Commercial ☐ Single Family Residence ☐ Apartment/Condominium
3. Tenant Improvement: ☐ Yes ☐ No
4. Size of Project: \_\_\_\_\_ sq. ft. Construction Valuation \$ \_\_\_\_\_
5. Project Completion Date: \_\_\_\_\_
6. Briefly state how solid waste material was handled on your job site to ensure salvage/reuse or recycling.

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Please do not write below this line

Plan approve by: \_\_\_\_\_ Title: \_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_



## Post-Construction Waste Reduction & Recycling Summary Report



**Diversion Requirement:** Reduce quantity of materials disposed at landfills by 65% or more.

Column A: List estimated quantities of waste for each material type (in tons). To convert material quantities to tons, use the Materials Conversion Worksheet provided in your packet.

Columns B, C, D: List estimated quantities reused, recycled, or disposed.

Column E: State the name of all vendors or facilities to be used to reuse, recycle or dispose of material listed. See example below for cases where more than one facility will be used for a particular material type.

Column Totals: Add up all quantities listed in Column A. Do the same for Columns B, C and D.

Building Permit#: \_\_\_\_\_ Project Address: \_\_\_\_\_

### Waste Reduction & Recycling Summary REPORT (WRRS Report)

Material Handling Methods - Indicate quantities (in tons only) for each material listed.					
Material Type	<u>A</u> Total Tons Generated (A=B+C+D)	<u>B</u> Quantity Salvaged or Reused	<u>C</u> Recycling	<u>D</u> Estimated Disposal	<u>E</u> Anticipated Material Destination(s) (R): Recycled; (D): Disposal
Example: Cardboard	2 tons		1.5	.5	(R) MarBorg (D) Tajiguas Landfill
Asphalt & Concrete					
Brick/Masonry/Tile					
Building Materials (doors, windows, fixtures, etc.)					
Carpet					
Carpet padding/Foam					
Cardboard					
Ceiling tile (acoustic)					
Dirt					
Drywall (used)					
Drywall (new, unpainted sheets or scrap)					
Landscape Debris (brush, trees, stumps, etc.)					
Scrap metal					
Unpainted Wood and Pallets					
Garbage/Trash					
Other					
Recycled mixed debris					
Column Totals					

7. To determine if the required 65% project waste reduction will be met, complete the following with the column totals:

(B \_\_\_\_\_ + C \_\_\_\_\_) / A \_\_\_\_\_ = \_\_\_\_\_ x 100 = \_\_\_\_\_ %

8. Is the percentage listed in #7 greater than or equal to 65%? ☐ YES ☐ NO - If "NO" please explain why:

\_\_\_\_\_

\_\_\_\_\_

9. Print Name: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_/\_\_\_\_/\_\_\_\_



**For Reference Only**  
**MATERIALS CONVERSION WORKSHEET - SEPARATED MATERIALS<sup>1</sup>**  
**(Total Tons Generated)**

This worksheet lists materials typically generated from a construction or demolition project and provides formulas for converting common units (i.e. cubic yards, square feet and board feet) to tons. It can be used for preparing your WMP Report, which require that quantities be provided in tons. Step 1 - For your WMP, enter estimated quantity for each applicable material in Column I, based on units of cubic yards (cy), cubic foot (cu ft), square feet (sq ft), or board foot (bd ft). For your Summary Report, use the actual quantities, based on weight tags, gate receipts, or other documents. Step 2 - Multiply by Tons/Unit figure listed in Worksheet Column II. Enter the result for each material in Column III. Step 3 - Enter quantities for each separated material from Column C on the Worksheet into the corresponding section of Column A of your WMP Report.

<u>Material Category</u>	<u>Column I Volume</u>	<u>Units</u>	<u>x</u>	<u>Column II Tons/unit</u>	<u>=</u>	<u>Column III Tons</u>
<b>Asphalt/Concrete</b>	Asphalt (broken) _____	cy	x	.7	=	_____
	Concrete (broken) _____	cy	x	.9	=	_____
	Concrete (solid slab) _____	cy	x	1.2975	=	_____
<b>Brick/Masonry/Tile</b>	Brick (broken) _____	cy	x	.7	=	_____
	Brick (whole, palletized) _____	cy	x	1.512	=	_____
	Masonry Block (broken) _____	cy	x	.6	=	_____
	Tile _____	sq ft	x	.00175	=	_____
<b>Building Materials</b> (doors, windows, cabinets, etc.)	_____	cy	x	.15	=	_____
<b>Cardboard</b> (flat)	_____	cy	x	.05	=	_____
<b>Carpet</b>	(by square foot) _____	sq ft	x	.0005	=	_____
	(by cubic yard) _____	cy	x	.3	=	_____
<b>Carpet Padding/Foam</b>	_____	sq ft	x	.000125	=	_____
<b>Ceiling Tiles</b>	(whole - palletized) _____	sq ft	x	.0003	=	_____
	(loose) _____	cy	x	.0875	=	_____
<sup>2</sup> <b>Dirt</b>	_____	cu ft	x	.3852	=	_____
<b>Drywall</b> (new or used)	1/2" (by square foot) _____	sq ft	x	.0008	=	_____
	5/8" (by square foot) _____	sq ft	x	.00105	=	_____
<b>Drywall</b> (demo/used)	(by cubic yard) _____	cy	x	.25	=	_____
<b>Garbage/Trash</b>	_____	cy	x	.175	=	_____
<b>Landscape Debris</b> (brush trees, etc.)	_____	cy	x	.15	=	_____
<b>Scrap Metal</b>	_____	cy	x	.453	=	_____
<b>Unpainted Wood &amp; Pallets</b>	(by board foot) _____	bd ft	x	.001375	=	_____
	(by cubic yard) _____	cy	x	.15	=	_____
<sup>3</sup> <b>Other</b>	_____		x		=	_____
						<b>Total Tons =</b> _____

cy = cubic yards   cu ft = cubic foot   sq ft = square foot   bd ft = board foot

<sup>1</sup> For additional conversion factors go to <https://www2.calrecycle.ca.gov/Search/?q=conversion+factors>

Sources:

<sup>1</sup> City of Oakland PWD

<sup>2</sup> CalRecycle (factor averaged between 5 different types of dirt and converted to tons for consistency)

<sup>3</sup> For additional conversion factors go to <https://www2.calrecycle.ca.gov/Search/?q=conversion+factors>



**Notification for Renovation and  
Demolition  
ENF-28**

Santa Barbara County Air Pollution Control  
District  
260-A N San Antonio Rd, Santa Barbara, CA  
93110-1315

**Please read the instructions and definitions on pages 4 and 5 prior to completing this form.**

**Section I. Notification**

Demolition Dates:

\*Start Date: \_\_\_\_\_

Finish Date: \_\_\_\_\_

Asbestos Abatement Dates:

\*Start Date: \_\_\_\_\_

Finish Date: \_\_\_\_\_

PROJECT #: \_\_\_\_\_

Start Date: \_\_\_\_\_

Finish Date: \_\_\_\_\_

**\*You MUST start on this date or revise this notification.  
See instructions for start date change requirements.**

*Indicate type of Notification:*

Emergency (E) \_\_\_\_\_ (See page 4 for Emergency definition – Prior approval is recommended!)

ORIG \_\_\_\_\_ Asbestos No. \_\_\_\_\_ REV 1 2 3 4 (Circle One) CANCL \_\_\_\_\_

**Fees for Asbestos Demolition and Renovation (District Rule 210, schedule E)**

(Please check box and submit proper amount)

Demolition of Regulated Facility: (demolitions require a stand-alone notification, see attached definitions).  
Each Building .....\$ 173.00 ☐

**Asbestos Removal Renovations:**

260 linear or 160 square feet but  
Less than 500 linear or square feet .....\$ 696.00 ☐  
500 or greater but less than 1000 .....\$ 987.00 ☐  
1000 or greater but less than 2500 .....\$ 1,323.00 ☐  
2500 or greater but less than 5000 .....\$ 1,636.00 ☐  
5000 or greater but less than 10,000 .....\$ 1,916.00 ☐  
10,000 or greater .....\$ 2,264.00 ☐

► **Attach Asbestos Survey**

FOR DISTRICT USE ONLY		DATE STAMP
Asbestos No.		
Postmark Date		
Check / CC #		
Fee Amount Paid		

**Section II. Addresses**

Asbestos Contractor:

Company Name: \_\_\_\_\_

Contact Name: \_\_\_\_\_

Address: \_\_\_\_\_

City: \_\_\_\_\_

State/Zip: \_\_\_\_\_

Phone:(\_\_\_\_) \_\_\_\_\_

Facility Owner: \_\_\_\_\_

Address: \_\_\_\_\_

City: \_\_\_\_\_

State/Zip: \_\_\_\_\_

Phone:(\_\_\_\_) \_\_\_\_\_

General Contractor:

Company Name: \_\_\_\_\_

Contact Name: \_\_\_\_\_

Address: \_\_\_\_\_

City: \_\_\_\_\_

State/Zip: \_\_\_\_\_

Phone:(\_\_\_\_) \_\_\_\_\_

Facility: \_\_\_\_\_ Age: \_\_\_\_\_

Description &amp; Use: \_\_\_\_\_

Street Ad: \_\_\_\_\_

City: \_\_\_\_\_

State/Zip: \_\_\_\_\_

Sq Ft of Facility or Project \_\_\_\_\_

**Section III. Project Specifications** (circle one) Renovation or Demolition (see definition)Is Asbestos Containing Material (ACM) present? ( Yes / No ) ( **Attach Survey** )Asbestos Type & percent %: Amosite Amphibole Chrysotile Other

Amount of Asbestos to be removed

Unit	Total RACM To Be Removed	Nonfriable Asbestos Containing Material	
		Category I	Category II
Linear Feet (Pipes)			
Square Feet (Surface Area)			

**Section IV. Procedures** - Procedure used to detect the presence of Asbestos Containing Materials (ACM):

(circle) visual Bulk sampling PLM PCM TEM

Description of planned demolition or renovation work to be performed and method(s) to be employed, including demolition and renovation techniques to be used and description of facility components: \_\_\_\_\_

---



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Description of work practices and engineering controls to be used to comply with 40 CFR Part 61, including asbestos removal and waste handling emission control procedures: \_\_\_\_\_

---



---

**Section V. Disposal**

Waste Transporter #1: Name: \_\_\_\_\_ Tel.#: (\_\_\_\_) \_\_\_\_\_

Address: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip Code: \_\_\_\_\_

Waste Disposal Site: Name: \_\_\_\_\_ Tel.#: (\_\_\_\_) \_\_\_\_\_

Location: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip Code: \_\_\_\_\_

**Section VI. Governmental Ordered Demolition - Attach Order.****Section VII. Emergency Renovations - Call for Approval.**

Be prepared to provide the following information: the date and hour the emergency occurred, a description of the sudden and unexpected event, and an explanation of how the event caused an unsafe condition, or would cause equipment damage or an unreasonable financial burden.

**Section VIII. Unexpected Discovery of Asbestos**

Description of procedures to be followed in the event that unexpected Asbestos is found or previously nonfriable Asbestos material becomes crumbled, pulverized, or reduced to powder: \_\_\_\_\_

**Section IX. Trained Individual On-Site (if applicable)**

I certify that a trained individual in the provisions of the NESHAP regulation will be on-site during the renovation or demolition of any Asbestos Containing Material and evidence that the required training has been accomplished by this person will be available for inspection during project hours.

\_\_\_\_\_  
Print Name of On-site Trained Supervisor(s)

\_\_\_\_\_  
cell ph # or/on-site ph # / pager #

\_\_\_\_\_  
Certification #

\_\_\_\_\_  
Training Provider

\_\_\_\_\_  
Exp. Date

**Section X. Statement**

I certify pursuant to Health & Safety Code Section 42303.5 that all information contained herein and information submitted with this notification is true and correct:

\_\_\_\_\_  
(Signature of Responsible Party) (Date)

\_\_\_\_\_  
Print Name

\_\_\_\_\_  
Telephone Number

Additional Comments:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## INSTRUCTIONS FOR COMPLETING DISTRICT FORM ENF-28

Please note that verbal or facsimile notifications will not be accepted. Original notifications may be sent via mail, email, or delivered by hand. Emailed notifications must be in a non-editable format (i.e. pdf) and include form APCD-01C for credit card payment. All notifications must be accompanied by payment and survey. A revision is required any time the amount of affected ACM changes by 20% or more and/or whenever a reported start date changes.

### Section I. Notification

- A. Notifications should be sent to the Santa Barbara County Air Pollution Control District at 260-A N San Antonio Rd, Santa Barbara, CA 93110-1315 (for projects being performed in Santa Barbara County). Email notifications should be sent to [asbestos@sbcapcd.org](mailto:asbestos@sbcapcd.org). When submitting via email, if you do not receive a response within 72 hours confirming that the District has received your submittal, please assume the notification was not received and contact us at 805-979-8050.

- B. Asbestos notification requirements are as follows:

1. Notification of all Renovations and Demolitions are to be postmarked or delivered to the District 10 working days prior to starting work, unless it is an Emergency Renovation.

*Note: Emergency Renovation, as defined by 40 CFR §61.141, means a renovation operation that was not planned but results from a sudden, unexpected event that, if not immediately attended to, presents a safety or public health hazard, is necessary to protect equipment from damage, or is necessary to avoid imposing an unreasonable financial burden. This term includes operations necessitated by non-routine failures of equipment.*

Calling for prior Emergency approval is recommended.

2. Please indicate whether the Notification for the Project is an Original, Revision, or Cancellation in the space provided.
3. Attach copy of asbestos survey.
4. Please check appropriate box(es) for fee submittal. Amount submitted should correspond with fee schedule. Fees are subject to change every July 1<sup>st</sup>. Ensure that you are using the most current form and fee schedule. *Note:* Notifications received without the appropriate fee are considered incomplete. Credit card payments must use form APCD-01C.
5. If a revision to a notification is needed, please write the assigned Asbestos No. (call 805-979-8050 for number) in the space provided and submit only page one.
6. Start date changes: If the revised start date is after the original, you must notify the District as soon as possible and by no later than the original start date. If the revised date is before the original, notification must be made at least 10 working days before the revised start date.

- C. All demolitions of regulated facilities are regulated by NESHAP and require written notification.

### Section II. Addresses

- A. Please complete all areas that are applicable. If sections are the same Name and Address (e.g., Owner and Facility), entering "same" is acceptable.
- B. In the event there is no asbestos to be removed and no Asbestos Contractor is hired – leave blank.
- C. General Contractor means the contractor or company employed by the owner to complete the project.
- D. Facility: provide the name, description & use (i.e. retail – coffee shop/merchandise/restaurant, apartments, medical, office, etc), and actual street location of the structure/project. Include the square footage of the structure for demolitions or project square footage for renovations.

### Section III. Project Specifications

- A. From the results of your survey identify the types and percent of asbestos present in the structure/facility.
- B. The total amount of Regulated Asbestos Containing Material (RACM) must be entered. **\*\*It is this amount that determines the fees required in Section I.\*\***

### Section IV. Procedures

- A. Please complete all areas that are applicable.
- B. Briefly describe the types of ACM to be removed and the removal method(s). (i.e. remove acoustic ceiling tiles using wet methods.)
- C. Briefly describe the work practices and engineering controls to be used. (i.e. full containment and negative air.)

**Section V. Disposal** - Please complete all areas that are applicable. If more than one waste transporter will be used, please use the additional comments section for this information.

**Section VI. Government Ordered Demolition** - Complete all areas that are applicable and attach a copy of the order.

**Section VII. Emergency Renovation – Calling for Prior Approval is Recommended** - After initial call please complete all areas of notification that are applicable and submit within 48 hours. Work that definitively qualifies as an emergency may be started immediately. Starting a project early that is not an emergency will result in the issuance of a Notice of Violation and assessment of penalties.

**Section VIII. Unexpected Discovery of Asbestos** - Briefly describe the procedures to be used in the event of unexpected discovery of asbestos. (i.e. cease all work, seal the area, and contact a certified asbestos abatement contractor.)

**Section IX. Trained Individual On-Site** - If there is no asbestos involved in the renovation/demolition, there is no need to have a trained individual on-site and as such you may enter N/A in this block.

**Section X. Statement** - Certification statement must be signed by a responsible party which may be the owner of the property or a legal representative of the owner such as the General Contractor or Asbestos Consultant who has authority to sign for him/her. Be advised that whoever signs the notification has the obligation to provide revisions as required.

If you have any questions on completing this form, please contact the District  
and ask for the Asbestos Project Coordinator at (805) 979-8050.

**DEFINITIONS** *\*Note: definitions may differ from Building Department usage.*

**Asbestos containing material (ACM):** any material or product that contains more than 1% asbestos.

**Asbestos renovation:** the removal of more than 160 square feet or 260 linear feet of ACM.

**Category I nonfriable ACM:** asbestos-containing packings, gaskets, resilient floor covering, and asphalt roofing products. (typically pliable materials, including sealants and mastics)

**Category II nonfriable ACM:** any other ACM, excluding Cat. I nonfriable ACM, that when dry, **cannot** be crumbled, pulverized, or reduced to powder by hand pressure. (typically non-pliable/cementitious materials)

**Demolition:** the wrecking or taking out of any load-supporting structural member (i.e. - load bearing wall) of a facility together with any related handling operations or intentional burning of any facility. *\*Note: this definition may differ from Building Department usage.*

**District:** Santa Barbara County Air Pollution Control District

**Friable ACM:** any ACM that when dry, **can** be crumbled, pulverized, or reduced to powder by normal hand pressure.

**Nonfriable ACM:** any ACM that when dry, **cannot** be crumbled, pulverized, or reduced to powder by hand pressure.

**Regulated Asbestos Containing Material (RACM):** *any friable* ACM that will be disturbed during a renovation or demolition of a regulated facility. Also, any Category I or II nonfriable ACM that will become friable due to the removal technique is considered RACM.

**Regulated Facility:** any institutional, commercial, public, industrial, or residential structure, installation, or building (including any structure, installation, or building containing condominiums or individual dwelling units operated as a residential cooperative, but excluding residential buildings having four or fewer dwelling units). Any facility that was previously subject to this regulation is not excluded, regardless of its current use or function. *\*Note: single family residences and associated outbuildings are exempt.*

**Survey:** a thorough inspection of the facility and testing of materials to determine the presence of asbestos. State and federal regulations require that surveys be done by certified personnel.



Department of General Services  
130 Cremona Drive, Suite B  
Goleta, CA 93117

## CONTRACT CHANGE ORDER MEMO

Change Order No.

Date Prepared:

Project No.:

Project:

Contractor:

Address:

### DESCRIPTION AND JUSTIFICATION FOR CONTRACT CHANGE ORDER

What is Change:

Why is Change Necessary:

Where is the Change Located:

How will the Change be Implemented:

Time Adjustment for Change:

### CONTRACT CHANGE FINANCIAL IMPACT:

Original Contract Amount:	\$	-
Total Change Order Authority Approved by Council:	\$	-
Total Change By Previous Change Orders:	\$	-
Contract Amount Prior to This Change Order:	\$	-
Amount to be Increased By This Change Order:	\$	-
<b>Adjusted Contract Amount Including This Change Order:</b>	\$	-
Total Remaining Change Order Authority:	\$	-
Contract Period Increase Due to This Change Order:	Days	
Final Contract Completion Date Including This Change Order:	Days	

By:   
Name: Construction Manager



Department of General Services  
130 Cremona Drive, Suite B  
Goleta, CA 93117

## CONTRACT CHANGE ORDER

Change Order No.

Date Prepared:

Project No.:

Project:

Contractor:

Address:

**You are directed to make the following changes from the plans and specifications or do the following described work not included in the plans and specifications for this contract.**

Description of work to be done,  
estimate of quantities, and prices to be  
paid:

Estimated Cost:

By reason of this order, the time of  
completion will be adjusted as follows:

This sum constitutes full and complete compensation, for providing all labor, materials, equipment, tools, and incidentals, including all markups for this change.

Original Contract Amount:

\$ -

Total Change by Previous Change Orders and/or Quantity Adjustment:

\$ -

Contract Amount Prior to this Change Order:

\$ -

Contract Amount to be *Increased/Decreased* by this Change Order:

\$ -

Adjusted Contract Amount Including this Change Order:

\$ -

### PREPARED BY:

SIGNATURE

(PRINT NAME & TITLE)

DATE

### REVIEWED BY:

SIGNATURE

(PRINT NAME & TITLE)

DATE

### APPROVAL RECOMMENDED BY:

SIGNATURE

(PRINT NAME & TITLE)

DATE

### CITY APPROVAL BY:

SIGNATURE

(PRINT NAME & TITLE)

DATE





Department of General Services  
130 Cremona Drive, Suite B  
Goleta, CA 93117

## CONTRACT CHANGE ORDER

Change Order No.

Date Prepared:

Project No.:

Project:

Contractor: \_\_\_\_\_

The amount of the contract will be increased by the sum of \$ and the contract time shall be extended by XX calendar days. The undersigned Contractor approves the foregoing Change Order # XX as to the changes, if any, in the contract price specified for each item including any and all supervision costs and other miscellaneous costs relating to the change in work, and as to the extension of time allowed, if any, for completion of the entire work on account of said Change Order # . The Contractor agrees to furnish all labor and materials and perform all other necessary work, inclusive of the directly or indirectly related to the approved time extension, required to complete the Change order items. This document will become a supplement of the contract and all provisions will apply hereto. It is understood that the Change Order shall be effective when approved by the Owner.

Contractor accepts the terms and conditions stated above as full and final settlement of any and all claims arising out of or related to the subject of this Change Order and acknowledges that the compensation (time and cost) set forth herein comprises the total compensation due for the work or change defined in the Change Order, including all impact on any unchanged work. By signing this Change Order, the Contractor acknowledges and agrees that the stipulated compensation includes payment for all Work contained in the Change Order, plus all payment for any acceleration or interruption of schedules, extended overhead costs, delay, and all impact or cumulative impact on all Work under this Contract. The signing of this Change Order acknowledges full mutual accord and satisfaction for the change and that the stated time and/or cost constitute the total equitable adjustment owed the Contractor as a result of the change. The Contractor hereby releases and agrees to waive all rights, without exception or reservation of any kind whatsoever, to file any further claim or request for equitable adjustment of any type, for any reasonably foreseeable cause that shall arise out of, or as a result of, this Change Order and/or its impact on the remainder of the Work under the Contract.

### CONTRACTOR ACCEPTANCE BY:

SIGNATURE

(PRINT NAME & TITLE)

DATE

**CITY OF GOLETA, CA**  
**Form CC1 - Progress Payment Request**

From:

Date: \_\_\_\_\_

\_\_\_\_\_  
Contractor

Contract No.: \_\_\_\_\_

Payment Request No.: \_\_\_\_\_

\_\_\_\_\_  
Address

To:

CITY OF GOLETA  
130 Cremona Drive, Suite B Goleta,  
California 93117

Project Name:

Original Contract Amount:

\$

Approved Change Orders through #: \_\_\_\_\_

\$

Quantity Changes:

\$

(Requires Project Architect verification)

Total Contract Amount to Date:

\$

Value of Work Completed to Date:

\$

Less Retention:

\$

Less Liquidated Damages:

\$

Subtotal:

\$

Less Previous Payments Approved:

\$

Progress Payment Requested:

\$

The undersigned Contractor or Contractor's Authorized Representative certifies that to the best of his or her knowledge, information and belief, the work covered in this application for payment has been completed in accordance with the contract documents and the costs shown are true and correct.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Print Name

\_\_\_\_\_  
Title

\_\_\_\_\_  
Date

**CITY OF GOLETA, CA**  
**Form CC2 - Progress Payment Request - Detail**

Date: \_\_\_\_\_ Payment Request No: \_\_\_\_\_ Contract No.: \_\_\_\_\_

Contractor: \_\_\_\_\_

Project Name: \_\_\_\_\_

ITEM NO.	DESCRIPTION	UNIT	BID QUANTITY	UNIT/ FIRM PRICE	INPLACE THIS PERIOD		INPLACE TOTAL	
					QTY. OR %	EXTN.	QTY. OR %	EXTN.
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								

\_\_\_\_\_  
Contractor Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Inspector Signature

\_\_\_\_\_  
Date

**CITY OF GOLETA, CA**  
**Form CC3 - Quantity Change Verification Form**

Date:

Contract No.:

Contractor:

Project Name:

**INSTRUCTIONS**

This form is to accompany progress payments where there is quantity changes (variations in quantities authorized as part of the progress or final payment.

The quantity changes in amount of \$\_\_\_\_\_ accompanying Progress Payment #\_\_\_\_\_ have been reviewed and actual quantities verified.

Project Architect Signature

Date

Bid Item #	Item Description	Variance	Total

**ATTACH ADDITIONAL SHEETS IF NECESSARY**

\_\_\_\_\_  
Contractor Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Inspector Signature

\_\_\_\_\_  
Date

**CITY OF GOLETA, CA**  
**Construction Contract**  
**Form CC4 - Final Release Payment**

From: \_\_\_\_\_

Date: \_\_\_\_\_ Contractor

Contract No. \_\_\_\_\_

\_\_\_\_\_  
Address

Payment Request No. \_\_\_\_\_

Project Name: \_\_\_\_\_

To: CITY OF GOLETA  
130 Cremona Drive  
Goleta, California 93117

Upon settlement of final quantities and approval of a Notice of Completion for the project by the Goleta City Council, including any approved changes, this document shall be effective to release any and all further rights of the Contractor to security for payment, including any worker's, mechanic's or material supplier's lien, stop notice claim or right to bond that the undersigned may have for the work furnished for the project. This document is offered as evidence for settlement of final payment and to induce the City Council to approve such final payment for Contractor in connection with the PROJECT NAME.

This release covers the final payment to the undersigned for all labor, services, equipment and material furnished on the job, including the work of all subcontractors and all materials furnished for all suppliers, and other agents acting on behalf of the undersigned on this work. There are no disputed claims for additional work.

\_\_\_\_\_  
Contractor Signature:

\_\_\_\_\_  
Print Name:

\_\_\_\_\_  
Title:

\_\_\_\_\_  
Date:

NOTICE: A signed final release is required with submittal of request for payment.