

# City of San Diego

**CONTRACTOR'S NAME:** Bilbro Construction Company Inc.  
**ADDRESS:** 876 N Broadway, Escondido, CA 92025  
**TELEPHONE NO.:** (760) 871-0477 x31 **FAX NO.:** (760) 871-0477  
**CITY CONTACT:** Juan E. Espindola, Contract Specialist, Email: [JEEspindola@sandiego.gov](mailto:JEEspindola@sandiego.gov)  
Phone No. (619) 533-4491, Fax No. (619) 533-3633  
M. Maria / A. James / cc

## BIDDING DOCUMENTS



**FOR**

## FIRE STATION NUMBER 3, 8 AND 15 RENOVATIONS

**BID NO.:** K-18-1557-DBB-3  
**SAP NO. (WBS/IO/CC):** B-13187, S-10029, S-13011  
**CLIENT DEPARTMENT:** 1912  
**COUNCIL DISTRICT:** 3, 4  
**PROJECT TYPE:** BC

**THIS CONTRACT WILL BE SUBJECT TO THE FOLLOWING:**

- PHASED-FUNDING
- THE CITY'S SUBCONTRACTING PARTICIPATION REQUIREMENTS FOR SLBE PROGRAM
- PREVAILING WAGE RATES: STATE  FEDERAL
- APPRENTICESHIP

**BID DUE DATE:**

**2:00 PM**  
**DECEMBER 14, 2017**  
**CITY OF SAN DIEGO**  
**PUBLIC WORKS CONTRACTS**  
**1010 SECOND AVENUE, 14<sup>th</sup> FLOOR, MS 614C**  
**SAN DIEGO, CA 92101**

**ENGINEER OF WORK**

The engineering Specifications and Special Provisions contained herein have been prepared by or under the direction of the following Registered Engineer/Architect:

  
1) Registered Architect

11.03.17  
Date

Seal:



  
2) For City Engineer

11/8/17  
Date

Seal:



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## NOTICE INVITING BIDS

1. **SUMMARY OF WORK:** This is the City of San Diego's (City) solicitation process to acquire Construction services for **Fire Station Number 3, 8 and 15 Renovations**. For additional information refer to Attachment A.
2. **FULL AND OPEN COMPETITION:** This contract is open to full competition and may be bid on by Contractors who are on the City's current Prequalified Contractors' List. For information regarding the Contractors Prequalified list visit the City's web site: <http://www.sandiego.gov>.
3. **ESTIMATED CONSTRUCTION COST:** The City's estimated construction cost for this project is **\$1,980,300**.
4. **BID DUE DATE AND TIME ARE: DECEMBER 14, 2017 at 2:00 PM**
5. **PREVAILING WAGE RATES APPLY TO THIS CONTRACT:** Refer to Attachment D.
6. **LICENSE REQUIREMENT:** The City has determined that the following licensing classification is required for this contract: **B**
7. **SUBCONTRACTING PARTICIPATION PERCENTAGES:** Subcontracting participation percentages apply to this contract.
  - 7.1. The City has incorporated **mandatory** SLBE-ELBE subcontractor participation percentages to enhance competition and maximize subcontracting opportunities. For the purpose of achieving the mandatory subcontractor participation percentages, a recommended breakdown of the SLBE and ELBE subcontractor participation percentages based upon certified SLBE and ELBE firms has also been provided to achieve the mandatory subcontractor participation percentages:

1. SLBE participation	<b>3.7%</b>
2. ELBE participation	<b>6.0%</b>
3. Total mandatory participation	<b>9.7%</b>
  - 7.2. The Bid may be declared non-responsive if the Bidder fails to meet the following requirements:
    - 7.2.1. Attend the Pre-Bid Meeting as described herein.
    - 7.2.2. Include SLBE-ELBE certified subcontractors at the overall mandatory participation percentage identified in this document; **OR**
    - 7.2.3. Submit Good Faith Effort documentation, saved in searchable Portable Document Format (PDF) and stored on Compact Disc (CD) or Digital Video



Disc (DVD), demonstrating the Bidder made a good faith effort to outreach to and include SLBE-ELBE Subcontractors required in this document within 3 Working Days of the Bid opening if the overall mandatory participation percentage is not met.

**8. PRE-BID MEETING:**

**8.1.** Prospective Bidders are **encouraged** to attend the Pre-Bid Meeting. The purpose of the meeting is to discuss the scope of the Project, submittal requirements, the pre-qualification process and any Equal Opportunity Contracting Program requirements and reporting procedures. To request a sign language or oral interpreter for this visit, call the Public Works Contracts Division at (619) 533-3450 at least 5 Working Days prior to the meeting to ensure availability. The Pre-Bid meeting is scheduled as follows:

**Date: November 29, 2017**  
**Time 10:00 AM**  
**Location: 1010 Second Ave, Suite 1400 (Large Conf. Room)**  
**San Diego, CA 92101**

Attendance at the Pre-Submittal Meeting will be evidenced by the Bidder's representative's signature on the attendance roster. It is the responsibility of the Bidder's representative to complete and sign the attendance roster.

**9. PRE-BID SITE VISIT:** All those wishing to submit a bid are **encouraged** to visit the Work Site with the Engineer. The purpose of the Site visit is to acquaint Bidders with the Site conditions. To request a sign language or oral interpreter for this visit, call the Public Works Contracts at (619) 533-3450 at least 5 Working Days prior to the meeting to ensure availability. The Pre-Bid Site Visit is scheduled as follows:

**Time: 11:30 AM**  
**Date: November 29, 2017**  
**Location: 4711 Voltaire St., San Diego, CA 92107**

**Time: 1:00 PM**  
**Date: November 29, 2017**  
**Location: 725 W Kalmia St., San Diego, CA 92101**

**Time: 2:00 PM**  
**Date: November 29, 2017**  
**Location: 3974 Goldfinch St., San Diego, CA 92103**

**10. AWARD PROCESS:**

- 10.1.** The Award of this contract is contingent upon the Contractor's compliance with all conditions of Award as stated within these documents and within the Notice of Intent to Award.
- 10.2.** Upon acceptance of a Bid, the City will prepare contract documents for execution within approximately 21 days of the date of the Bid opening. The City will then award the Contract within approximately 14 days of receipt of properly signed Contract, bonds, and insurance documents.
- 10.3.** This contract will be deemed executed and effective only upon the signing of the Contract by the Mayor or his designee and approval as to form the City Attorney's Office.
- 10.4.** The low Bid will be determined by Base Bid alone.
- 10.5.** Once the low bid has been determined, the City may, at its sole discretion, award the contract for the Base bid alone; or for the Base bid plus one or more alternates.

**11. SUBMISSION OF QUESTIONS:**

- 11.1.** The Public Works Department is responsible for opening, examining, and evaluating the competitive Bids submitted to the City for the acquisition, construction and completion of any public improvement except when otherwise set forth in these documents. Any questions related to this solicitation shall be submitted to:

Public Works Contracts  
1010 Second Avenue, 14<sup>th</sup> Floor  
San Diego, California, 92101  
Attention: Michelle Munoz

OR:

[MichelleM@sandiego.gov](mailto:MichelleM@sandiego.gov)

- 11.2.** Questions received less than 14 days prior to the date for opening of Bids may not be considered.
- 11.3.** Questions or clarifications deemed by the City to be material shall be answered via issuance of an addendum and posted to the City's online bidding service.
- 11.4.** Only questions answered by formal written addenda shall be binding. Oral and other interpretations or clarifications shall be without legal effect. It is the Bidder's responsibility to be informed of any addenda that have been issued and to include all such information in its Bid.

## INSTRUCTIONS TO BIDDERS

### 1. PREQUALIFICATION OF CONTRACTORS:

- 1.1. Contractors submitting a Bid must be pre-qualified for the total amount proposed, including all alternate items, prior to the date of submittal. Bids from contractors who have not been pre-qualified as applicable and Bids that exceed the maximum dollar amount at which contractors are pre-qualified may be deemed **non-responsive** and ineligible for award. Complete information and links to the on-line prequalification application are available at:

<http://www.sandiego.gov/cip/bidopps/prequalification.shtml>

- 1.2. The completed application must be submitted online no later than 2 weeks prior to the bid opening. For additional information or the answer to questions about the prequalification program, contact David Stucky at 619-533-3474 or [dstucky@sandiego.gov](mailto:dstucky@sandiego.gov).
- 1.3. Due to the City's responsibility to protect the confidentiality of the contractors' information, City staff will not be able to provide information regarding contractors' prequalification status over the telephone. Contractors may access real-time information about their prequalification status via their vendor profile on [PlanetBids™](#).

2. **ELECTRONIC FORMAT RECEIPT AND OPENING OF BIDS:** Bids will be received in electronic format (eBids) EXCLUSIVELY at the City of San Diego's electronic bidding (eBidding) site, at: <http://www.sandiego.gov/cip/bidopps/index.shtml> and are due by the date, and time shown on the cover of this solicitation.

- 2.1. BIDDERS MUST BE PRE-REGISTERED with the City's bidding system and possess a system-assigned Digital ID in order to submit and electronic bid.
- 2.2. The City's bidding system will automatically track information submitted to the site including IP addresses, browsers being used and the URLs from which information was submitted. In addition, the City's bidding system will keep a history of every login instance including the time of login, and other information about the user's computer configuration such as the operating system, browser type, version, and more. Because of these security features, Contractors who disable their browsers' cookies will not be able to log in and use the City's bidding system.
- 2.3. The City's electronic bidding system is responsible for bid tabulations. Upon the bidder's or proposer's entry of their bid, the system will ensure that all required fields are entered. **The system will not accept a bid for which any required information is missing.** This includes all necessary pricing, subcontractor listing(s)

and any other essential documentation and supporting materials and forms requested or contained in these solicitation documents.

**2.4. BIDS REMAIN SEALED UNTIL BID DEADLINE.** eBids are transmitted into the City's bidding system via hypertext transfer protocol secure (https) mechanism using SSL 128-256 bit security certificates issued from Verisign/Thawte which encrypts data being transferred from client to server. Bids submitted prior to the "Bid Due Date and Time" are not available for review by anyone other than the submitter which has until the "Bid Due Date and Time" to change, rescind or retrieve its proposal should it desire to do so.

**2.5. BIDS MUST BE SUBMITTED BY BID DUE DATE AND TIME.** Once the bid deadline is reached, no further submissions are accepted into the system. Once the Bid Due Date and Time has lapsed, bidders, proposers, the general public, and City staff are able to immediately see the results on line. City staff may then begin reviewing the submissions for responsiveness, EOCB compliance and other issues. The City may require any Bidder to furnish statement of experience, financial responsibility, technical ability, equipment, and references.

**2.6. RECAPITULATION OF THE WORK.** Bids shall not contain any recapitulation of the Work. Conditional Bids may be rejected as being non-responsive. Alternative proposals will not be considered unless called for.

**2.7. BIDS MAY BE WITHDRAWN** by the Bidder only up to the bid due date and time.

**2.7.1. Important Note:** Submission of the electronic bid into the system may not be instantaneous. Due to the speed and capabilities of the user's internet service provider (ISP), bandwidth, computer hardware and other variables, it may take time for the bidder's submission to upload and be received by the City's eBidding system. It is the bidder's sole responsibility to ensure their bids are received on time by the City's eBidding system. The City of San Diego is not responsible for bids that do not arrive by the required date and time.

**2.8. ACCESSIBILITY AND AMERICANS WITH DISABILITIES ACT (ADA) COMPLIANCE:** To request a copy of this solicitation in an alternative format, contact the Public Works Contract Specialist listed on the cover of this solicitation at least five (5) working days prior to the Bid/Proposal due date to ensure availability.

### **3. ELECTRONIC BID SUBMISSIONS CARRY FULL FORCE AND EFFECT**

**3.1.** The bidder, by submitting its electronic bid, acknowledges that doing so carries the same force and full legal effect as a paper submission with a longhand (wet) signature.

- 3.2.** By submitting an electronic bid, the bidder certifies that the bidder has thoroughly examined and understands the entire Contract Documents (which consist of the plans and specifications, drawings, forms, affidavits and the solicitation documents), and that by submitting the eBid as its bid proposal, the bidder acknowledges, agrees to and is bound by the entire Contract Documents, including any addenda issued thereto, and incorporated by reference in the Contract Documents.
- 3.3.** The Bidder, by submitting its electronic bid, agrees to and certifies under penalty of perjury under the laws of the State of California, that the certification, forms and affidavits submitted as part of this bid are true and correct.
- 3.4.** The Bidder agrees to the construction of the project as described in Attachment “A–Scope of Work” for the City of San Diego, in accordance with the requirements set forth herein for the electronically submitted prices. The Bidder guarantees the Contract Price for a period of 120 days (90 days for federally funded contracts and contracts valued at \$500,000 or less) from the date of Bid opening. The duration of the Contract Price guarantee shall be extended by the number of days required for the City to obtain all items necessary to fulfill all conditions precedent.
- 4. **BIDS ARE PUBLIC RECORDS:**** Upon receipt by the City, Bids shall become public records subject to public disclosure. It is the responsibility of the respondent to clearly identify any confidential, proprietary, trade secret or otherwise legally privileged information contained within the Bid. General references to sections of the California Public Records Act (PRA) will not suffice. If the Contractor does not provide applicable case law that clearly establishes that the requested information is exempt from the disclosure requirements of the PRA, the City shall be free to release the information when required in accordance with the PRA, pursuant to any other applicable law, or by order of any court or government agency, and the Contractor will hold the City harmless for release of this information.
- 5. **CONTRACTOR REGISTRATION AND ELECTRONIC REPORTING SYSTEM:****

  - 5.1.** **Prior** to the Award of the Contract or Task Order, you and your Subcontractors and Suppliers must register with the City’s web-based vendor registration and bid management system. For additional information go to:  
  
<http://www.sandiego.gov/purchasing/bids-contracts/vendorreg.shtml>.
  - 5.2.** The City may not award the contract until registration of all subcontractors and suppliers is complete. In the event this requirement is not met within the time frame specified in the Notice of Intent to Award letter, the City reserves the right to rescind the Notice of Award / Intent to Award and to make the award to the next responsive and responsible bidder / proposer.

6. **JOINT VENTURE CONTRACTORS:** Provide a copy of the Joint Venture agreement and the Joint Venture license to the City within 10 Working Days after receiving the Contract forms. See 7-6, "The Contractors Representative" in The GREENBOOK and 7-6.1 in The WHITEBOOK.
7. **PREVAILING WAGE RATES WILL APPLY:** Refer to Attachment D.
8. **SUBCONTRACTING PARTICIPATION PERCENTAGES:** Subcontracting participation percentages apply to this contract. Refer to Attachment E.
9. **INSURANCE REQUIREMENTS:**
  - 9.1. All certificates of insurance and endorsements required by the contract are to be provided upon issuance of the City's Notice of Intent to Award letter.
  - 9.2. Refer to sections 7-3, "LIABILITY INSURANCE", and 7-4, "WORKERS' COMPENSATION INSURANCE" of the Supplementary Special Provisions (SSP) for the insurance requirements which must be met.
10. **REFERENCE STANDARDS:** Except as otherwise noted or specified, the Work shall be completed in accordance with the following standards:

Title	Edition	Document Number
Standard Specifications for Public Works Construction ("The GREENBOOK") <a href="http://www.greenbookspecs.org/">http://www.greenbookspecs.org/</a>	2015	PWPI070116-01
City of San Diego Standard Specifications for Public Works Construction ("The WHITEBOOK")* <a href="https://www.sandiego.gov/publicworks/edocref/greenbook">https://www.sandiego.gov/publicworks/edocref/greenbook</a>	2015	PWPI070116-02
City of San Diego Standard Drawings* <a href="https://www.sandiego.gov/publicworks/edocref/standarddraw">https://www.sandiego.gov/publicworks/edocref/standarddraw</a>	2016	PWPI070116-03
Citywide Computer Aided Design and Drafting (CADD) Standards <a href="https://www.sandiego.gov/publicworks/edocref/drawings">https://www.sandiego.gov/publicworks/edocref/drawings</a>	2016	PWPI092816-04
California Department of Transportation (CALTRANS) Standard Specifications – <a href="http://www.dot.ca.gov/des/oe/construction-contract-standards.html">http://www.dot.ca.gov/des/oe/construction-contract-standards.html</a>	2015	PWPI092816-05
CALTRANS Standard Plans <a href="http://www.dot.ca.gov/des/oe/construction-contract-standards.html">http://www.dot.ca.gov/des/oe/construction-contract-standards.html</a>	2015	PWPI092816-06

Title	Edition	Document Number
California Manual on Uniform Traffic Control Devices Revision 1 (CA MUTCD Rev 1) - <a href="http://www.dot.ca.gov/trafficops/camutcd/">http://www.dot.ca.gov/trafficops/camutcd/</a>	2014	PWPIO92816-07
<b>NOTE:</b> *Available online under Engineering Documents and References at: <a href="http://www.sandiego.gov/publicworks/edocref/index.shtml">http://www.sandiego.gov/publicworks/edocref/index.shtml</a>		

- 11. CITY'S RESPONSES AND ADDENDA:** The City, at its discretion, may respond to any or all questions submitted in writing via the City's eBidding web site in the **form of an addendum**. No other responses to questions, oral or written shall be of any force or effect with respect to this solicitation. The changes to the Contract Documents through addenda are made effective as though originally issued with the Bid. The Bidders shall acknowledge the receipt of Addenda at the time of bid submission.
- 12. CITY'S RIGHTS RESERVED:** The City reserves the right to cancel the Notice Inviting Bids at any time, and further reserves the right to reject submitted Bids, without giving any reason for such action, at its sole discretion and without liability. Costs incurred by the Bidder(s) as a result of preparing Bids under the Notice Inviting Bids shall be the sole responsibility of each bidder. The Notice Inviting Bids creates or imposes no obligation upon the City to enter a contract.
- 13. CONTRACT PRICING:** This solicitation is for a Lump Sum contract with Unit Price provisions as set forth herein. The Bidder agrees to perform construction services for the City of San Diego in accordance with these contract documents for the prices listed below. The Bidder further agrees to guarantee the Contract Price for a period of 120 days from the date of Bid opening. The duration of the Contract Price guarantee may be extended, by mutual consent of the parties, by the number of days required for the City to obtain all items necessary to fulfill all contractual conditions.
- 14. SUBCONTRACTOR INFORMATION:**

  - 14.1. LISTING OF SUBCONTRACTORS.** In accordance with the requirements provided in the "Subletting and Subcontracting Fair Practices Act" of the California Public Contract Code, the Bidder shall provide the **NAME** and **ADDRESS** of each Subcontractor who will perform work, labor, render services or who specially fabricates and installs a portion [type] of the work or improvement, in an amount in excess of 0.5% of the Contractor's total Bid. The Bidder shall also state within the description, whether the subcontractor is a **CONSTRUCTOR, CONSULTANT** or **SUPPLIER**. The Bidder shall state the **DIR REGISTRATION NUMBER** for all subcontractors and shall further state within the description, the **PORTION** of the work which will be performed by each subcontractor under this Contract. The Contractor shall list only one Subcontractor for each portion of the Work. The **DOLLAR VALUE** of the total Bid to be performed shall be stated for all

subcontractors listed. Failure to comply with this requirement may result in the Bid being rejected as **non-responsive** and ineligible for award. The Bidder's attention is directed to the Special Provisions - General; Paragraph 2-3, "Subcontracts", which stipulates the percent of the Work to be performed with the Bidders' own forces. The Bidder shall list all SLBE, ELBE, DBE, DVBE, MBE, WBE, OBE, SDB, WoSB, HUBZone, and SDVOSB Subcontractors for which Bidders are seeking recognition towards achieving any mandatory, voluntary (or both) subcontracting participation goals.

- 14.2. LISTING OF SUPPLIERS.** Any Bidder seeking the recognition of Suppliers of equipment, materials, or supplies obtained from third party Suppliers towards achieving any mandatory or voluntary (or both) subcontracting participation goals shall provide, at a minimum, the **NAME, LOCATION (CITY), DIR REGISTRATION NUMBER** and the **DOLLAR VALUE** of each supplier. The Bidder will be credited up to 60% of the amount to be paid to the Suppliers for materials and supplies unless vendor manufactures or substantially alters materials and supplies, in which case, 100% will be credited. The Bidder is to indicate within the description whether the listed firm is a supplier or manufacturer. If no indication is provided, the listed firm will be credited at 60% of the listed dollar value for purposes of calculating the Subcontractor Participation Percentage.
- 14.3. LISTING OF SUBCONTRACTORS OR SUPPLIERS FOR ALTERNATES.** For subcontractors or suppliers to be used on additive or deductive alternate items, in addition to the above requirements, bidder shall further note "ALTERNATE" and alternate item number within the description.
- 15. SUBMITTAL OF "OR EQUAL" ITEMS:** See Section 4-1.6, "Trade Names or Equals" in The WHITEBOOK and as amended in the SSP.
- 16. AWARD:**
- 16.1.** The Award of this contract is contingent upon the Contractor's compliance with all conditions precedent to Award.
- 16.2.** Upon acceptance of a Bid, the City will prepare contract documents for execution within approximately 21 days of the date of the Bid opening and award the Contract approximately within 7 days of receipt of properly executed Contract, bonds, and insurance documents.
- 16.3.** This contract will be deemed executed and effective only upon the signing of the Contract by the Mayor or his designee and approval as to form the City Attorney's Office.
- 17. SUBCONTRACT LIMITATIONS:** The Bidder's attention is directed to Standard Specifications for Public Works Construction, Section 2-3, "SUBCONTRACTS" in The GREENBOOK and as



amended in the SSP which requires the Contractor to self-perform not less than the specified amount. Failure to comply with this requirement shall render the bid **non-responsive** and ineligible for award.

- 18. AVAILABILITY OF PLANS AND SPECIFICATIONS:** Contract Documents may be obtained by visiting the City's website: <http://www.sandiego.gov/cip/>. Plans and Specifications for this contract are also available for review in the office of the City Clerk or Public Works Contracts.
- 19. ONLY ONE BID PER CONTRACTOR SHALL BE ACCEPTED:** No person, firm, or corporation shall be allowed to make, file, or be interested in more than one (1) Bid for the same work unless alternate Bids are called for. A person, firm or corporation who has submitted a sub-proposal to a Bidder, or who has quoted prices on materials to a Bidder, is not hereby disqualified from submitting a sub-proposal or quoting prices to other Bidders or from submitting a Bid in its own behalf. Any Bidder who submits more than one bid will result in the rejection of all bids submitted.
- 20. SAN DIEGO BUSINESS TAX CERTIFICATE:** The Contractor and Subcontractors, not already having a City of San Diego Business Tax Certificate for the work contemplated shall secure the appropriate certificate from the City Treasurer, Civic Center Plaza, First floor and submit to the Contract Specialist upon request or as specified in the Contract Documents. Tax Identification numbers for both the Bidder and the listed Subcontractors must be submitted on the City provided forms within these documents.
- 21. BIDDER'S GUARANTEE OF GOOD FAITH (BID SECURITY) FOR DESIGN-BID-BUILD CONTRACTS:**
  - 21.1.** For bids \$250,000 and above, bidders shall submit Bid Security at bid time. Bid Security shall be in one of the following forms: a cashier's check, or a properly certified check upon some responsible bank; or an approved corporate surety bond payable to the City of San Diego for an amount of not less than 10% of the total bid amount.
  - 21.2.** This check or bond, and the monies represented thereby, will be held by the City as a guarantee that the Bidder, if awarded the contract, will in good faith enter into the contract and furnish the required final performance and payment bonds.
  - 21.3.** The Bidder agrees that in the event of the Bidder's failure to execute this contract and provide the required final bonds, the money represented by the cashier's or certified check will remain the property of the City; and the Surety agrees that it will pay to the City the damages, not exceeding the sum of 10% of the amount of the Bid, that the City may suffer as a result of such failure.
  - 21.4.** At the time of bid submission, bidders must upload and submit an electronic PDF copy of the aforementioned bid security. Whether in the form of a cashier's check, a properly certified check or an approved corporate surety bond payable to the City of

San Diego, the bid security must be uploaded to the City's eBidding system. Within twenty-four (24) hours after the bid due date and time, the first five (5) apparent low bidders must provide the City with the original bid security.

- 21.5. Failure to submit the electronic version of the bid security at the time of bid submission AND failure to provide the original within twenty-four (24) hours may cause the bid to be rejected and deemed **non-responsive**.

## 22. **AWARD OF CONTRACT OR REJECTION OF BIDS:**

- 22.1. This contract may be awarded to the lowest responsible and reliable Bidder.
- 22.2. Bidders shall complete ALL eBid forms as required by this solicitation. Incomplete eBids will not be accepted.
- 22.3. The City reserves the right to reject any or all Bids, to waive any informality or technicality in Bids received, and to waive any requirements of these specifications as to bidding procedure.
- 22.4. Bidders will not be released on account of their errors of judgment. Bidders may be released only upon receipt by the City within 3 Working Days of the bid opening, written notice from the Bidder which shows proof of honest, credible, clerical error of a material nature, free from fraud or fraudulent intent; and of evidence that reasonable care was observed in the preparation of the Bid.
- 22.5. A bidder who is not selected for contract award may protest the award of a contract to another bidder by submitting a written protest in accordance with the San Diego Municipal Code.
- 22.6. The City of San Diego will not discriminate in the award of contracts with regard to race, religion creed, color, national origin, ancestry, physical handicap, marital status, sex or age.
- 22.7. Each Bid package properly signed as required by these specifications shall constitute a firm offer which may be accepted by the City within the time specified herein.
- 22.8. The City reserves the right to evaluate all Bids and determine the lowest Bidder on the basis of the base bid and any proposed alternates or options as detailed herein.

## 23. **BID RESULTS:**

- 23.1. The availability of the bids on the City's eBidding system shall constitute the public announcement of the apparent low bidder. In the event that the apparent low bidder is subsequently deemed non-responsive or non-responsible, a notation of such will be made on the eBidding system. The new ranking and apparent low bidder will be adjusted accordingly.

**23.2.** To obtain the bid results, view the results on the City's web site, or request the results by U.S. mail and provide a self-addressed, stamped envelope. If requesting by mail, be sure to reference the bid name and number. The bid tabulations will be mailed to you upon their completion. The results will not be given over the telephone.

**24. THE CONTRACT:**

**24.1.** The Bidder to whom award is made shall execute a written contract with the City of San Diego and furnish good and approved bonds and insurance certificates specified by the City within 14 days after receipt by Bidder of a form of contract for execution unless an extension of time is granted to the Bidder in writing.

**24.2.** If the Bidder takes longer than 14 days to fulfill these requirements, then the additional time taken shall be added to the Bid guarantee. The Contract shall be made in the form adopted by the City, which includes the provision that no claim or suit whatsoever shall be made or brought by Contractor against any officer, agent, or employee of the City for or on account of anything done or omitted to be done in connection with this contract, nor shall any such officer, agent, or employee be liable hereunder.

**24.3.** If the Bidder to whom the award is made fails to enter into the contract as herein provided, the award may be annulled and the Bidder's Guarantee of Good Faith will be subject to forfeiture. An award may be made to the next lowest responsible and reliable Bidder who shall fulfill every stipulation embraced herein as if it were the party to whom the first award was made.

**24.4.** Pursuant to the San Diego City Charter section 94, the City may only award a public works contract to the lowest responsible and reliable Bidder. The City will require the Apparent Low Bidder to (i) submit information to determine the Bidder's responsibility and reliability, (ii) execute the Contract in form provided by the City, and (iii) furnish good and approved bonds and insurance certificates specified by the City within 14 Days, unless otherwise approved by the City, in writing after the Bidder receives notification from the City, designating the Bidder as the Apparent Low Bidder and formally requesting the above mentioned items.

**24.5.** The award of the Contract is contingent upon the satisfactory completion of the above-mentioned items and becomes effective upon the signing of the Contract by the Mayor or designee and approval as to form the City Attorney's Office. If the Apparent Low Bidder does not execute the Contract or submit required documents and information, the City may award the Contract to the next lowest responsible and reliable Bidder who shall fulfill every condition precedent to award. A corporation designated as the Apparent Low Bidder shall furnish evidence of its corporate existence and evidence that the officer signing the Contract and bond for the corporation is duly authorized to do so.

- 25. EXAMINATION OF PLANS, SPECIFICATIONS, AND SITE OF WORK:** The Bidder shall examine carefully the Project Site, the Plans and Specifications, other materials as described in the Special Provisions, Section 2-7, and the proposal forms (e.g., Bidding Documents). The submission of a Bid shall be conclusive evidence that the Bidder has investigated and is satisfied as to the conditions to be encountered, as to the character, quality, and scope of Work, the quantities of materials to be furnished, and as to the requirements of the Bidding Documents Proposal, Plans, and Specifications.
- 26. CITY STANDARD PROVISIONS:** This contract is subject to the following standard provisions. See The WHITEBOOK for details.
- 26.1.** The City of San Diego Resolution No. R-277952 adopted on May 20, 1991 for a Drug-Free Workplace.
- 26.2.** The City of San Diego Resolution No. R-282153 adopted on June 14, 1993 related to the Americans with Disabilities Act.
- 26.3.** The City of San Diego Municipal Code §22.3004 for Contractor Standards.
- 26.4.** The City of San Diego's Labor Compliance Program and the State of California Labor Code §§1771.5(b) and 1776.
- 26.5.** Sections 1777.5, 1777.6, and 1777.7 of the State of California Labor Code concerning the employment of apprentices by contractors and subcontractors performing public works contracts.
- 26.6.** The City's Equal Benefits Ordinance (EBO), Chapter 2, Article 2, Division 43 of The San Diego Municipal Code (SDMC).
- 26.7.** The City's Information Security Policy (ISP) as defined in the City's Administrative Regulation 90.63.
- 27. PRE-AWARD ACTIVITIES:**
- 27.1.** The contractor selected by the City to execute a contract for this Work shall submit the required documentation as specified in the herein and in the Notice of Award. Failure to provide the information as specified may result in the Bid being rejected as **non-responsive**.
- 27.2.** The decision that bid is non-responsive for failure to provide the information required within the time specified shall be at the sole discretion of the City.

**PERFORMANCE BOND, LABOR AND MATERIALMEN'S BOND**

---

**FAITHFUL PERFORMANCE BOND AND LABOR AND MATERIALMEN'S BOND:**

Bilbro Construction Company, Inc., a corporation, as principal, and  
Arch Insurance Company, a corporation authorized to do  
business in the State of California, as Surety, hereby obligate themselves, their successors and  
assigns, jointly and severally, to The City of San Diego a municipal corporation in the sum of  
**Two Million Four Hundred Sixty Two Thousand Four Hundred Eighty Dollars and Zero Cents**  
**(\$2,462,480.00)** for the faithful performance of the annexed contract, and in the sum of **Two**  
**Million Four Hundred Sixty Two Thousand Four Hundred Eighty Dollars and Zero Cents**  
**(\$2,462,480.00)** for the benefit of laborers and materialmen designated below.

**Conditions:**

If the Principal shall faithfully perform the annexed contract with the City of San Diego,  
California, then the obligation herein with respect to a faithful performance shall be void; otherwise  
it shall remain in full force.

If the Principal shall promptly pay all persons, firms and corporations furnishing materials  
for or performing labor in the execution of this contract, and shall pay all amounts due under the  
California Unemployment Insurance Act then the obligation herein with respect to laborers and  
materialmen shall be void; otherwise it shall remain in full force.

The obligation herein with respect to laborers and materialmen shall inure to the benefit of  
all persons, firms and corporations entitled to file claims under the provisions of Article 2. Claimants,  
(III) public works of improvement commencing with Civil Code Section 9100 of the Civil Code of the  
State of California.

Changes in the terms of the annexed contract or specifications accompanying same or  
referred to therein shall not affect the Surety's obligation on this bond, and the Surety hereby  
waives notice of same.

The Surety shall pay reasonable attorney's fees should suit be brought to enforce the provisions of  
this bond.

PERFORMANCE BOND, LABOR AND MATERIALMEN'S BOND (continued)

Dated January 17, 2018

Approved as to Form

Bilbro Construction Company, Inc.

Principal

By 

Maryory Contreras, President


Printed Name of Person Signing for Principal

Mara W. Elliott, City Attorney


By   
Deputy City Attorney 4/20/18

Arch Insurance Company

Surety

By   
Erin A. Greene, Attorney-in-fact

Approved:

By   
Stephen Samara, Principal Contract Specialist  
Public Works Department

865 S. Figueroa Street, Suite 2700

Local Address of Surety

Los Angeles, CA 90017-5472

Local Address (City, State) of Surety

(201) 743-4000

Local Telephone No. of Surety

Premium \$ 26,040.00

Bond No. SU 1108538



**THIS POWER OF ATTORNEY IS NOT VALID UNLESS IT IS PRINTED ON BLUE BACKGROUND.**

***This Power of Attorney limits the acts of those named herein, and they have no authority to bind the Company except in the manner and to the extent herein stated. Not valid for Mortgage, Note, Loan, Letter of Credit, Bank Deposit, Currency Rate, Interest Rate or Residential Value Guarantees.***

## POWER OF ATTORNEY

Know All Persons By These Presents:

That the Arch Insurance Company, a corporation organized and existing under the laws of the State of Missouri, having its principal administrative office in Jersey City, New Jersey (hereinafter referred to as the "Company") does hereby appoint:

Erin A. Greene, James P. Schabarum II, Jase Hamilton, Jeffrey W. Cavignac and Julie A. Brennan of San Diego, CA (EACH)

its true and lawful Attorney(s)in-Fact, to make, execute, seal, and deliver from the date of issuance of this power for and on its behalf as surety, and as its act and deed:

Any and all bonds, undertakings, recognizances and other surety obligations, in the penal sum not exceeding Ninety Million Dollars (\$90,000,000.00).

This authority does not permit the same obligation to be split into two or more bonds In order to bring each such bond within the dollar limit of authority as set forth herein.

The execution of such bonds, undertakings, recognizances and other surety obligations in pursuance of these presents shall be as binding upon the said Company as fully and amply to all intents and purposes, as if the same had been duly executed and acknowledged by its regularly elected officers at its principal administrative office in Jersey City, New Jersey.

This Power of Attorney is executed by authority of resolutions adopted by unanimous consent of the Board of Directors of the Company on September 15, 2011, true and accurate copies of which are hereinafter set forth and are hereby certified to by the undersigned Secretary as being in full force and effect:

"VOTED, That the Chairman of the Board, the President, or the Executive Vice President, or any Senior Vice President, of the Surety Business Division, or their appointees designated in writing and filed with the Secretary, or the Secretary shall have the power and authority to appoint agents and attorneys-in-fact, and to authorize them subject to the limitations set forth in their respective powers of attorney, to execute on behalf of the Company, and attach the seal of the Company thereto, bonds, undertakings, recognizances and other surety obligations obligatory in the nature thereof, and any such officers of the Company may appoint agents for acceptance of process."

This Power of Attorney is signed, sealed and certified by facsimile under and by authority of the following resolution adopted by the unanimous consent of the Board of Directors of the Company on September 15, 2011:

VOTED, That the signature of the Chairman of the Board, the President, or the Executive Vice President, or any Senior Vice President, of the Surety Business Division, or their appointees designated in writing and filed with the Secretary, and the signature of the Secretary, the seal of the Company, and certifications by the Secretary, may be affixed by facsimile on any power of attorney or bond executed pursuant to the resolution adopted by the Board of Directors on September 15, 2011, and any such power so executed, sealed and certified with respect to any bond or undertaking to which it is attached, shall continue to be valid and binding upon the Company.





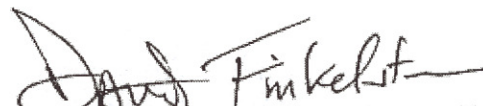
In Testimony Whereof, the Company has caused this instrument to be signed and its corporate seal to be affixed by their authorized officers, this 11<sup>th</sup> day of September, 2017.

Attested and Certified

Arch Insurance Company

  
Patrick K. Nails, Secretary

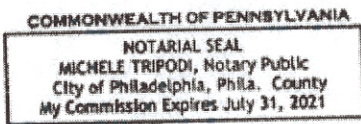


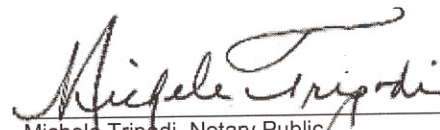
  
David M. Finkelstein, Executive Vice President

STATE OF PENNSYLVANIA SS

COUNTY OF PHILADELPHIA SS

I, Michele Tripodi, a Notary Public, do hereby certify that Patrick K. Nails and David M. Finkelstein personally known to me to be the same persons whose names are respectively as Secretary and Executive Vice President of the Arch Insurance Company, a Corporation organized and existing under the laws of the State of Missouri, subscribed to the foregoing instrument, appeared before me this day in person and severally acknowledged that they being thereunto duly authorized signed, sealed with the corporate seal and delivered the said instrument as the free and voluntary act of said corporation and as their own free and voluntary acts for the uses and purposes therein set forth.

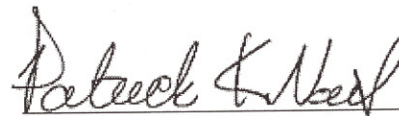


  
Michele Tripodi, Notary Public  
My commission expires 07/31/2021

CERTIFICATION

I, Patrick K. Nails, Secretary of the Arch Insurance Company, do hereby certify that the attached Power of Attorney dated September 11, 2017 on behalf of the person(s) as listed above is a true and correct copy and that the same has been in full force and effect since the date thereof and is in full force and effect on the date of this certificate; and I do further certify that the said David M. Finkelstein, who executed the Power of Attorney as Executive Vice President, was on the date of execution of the attached Power of Attorney the duly elected Executive Vice President of the Arch Insurance Company.

IN TESTIMONY WHEREOF, I have hereunto subscribed my name and affixed the corporate seal of the Arch Insurance Company on this JAN 17 2018 day of \_\_\_\_\_, 20\_\_\_\_.

  
Patrick K. Nails, Secretary

This Power of Attorney limits the acts of those named therein to the bonds and undertakings specifically named therein and they have no authority to bind the Company except in the manner and to the extent herein stated.

PLEASE SEND ALL CLAIM INQUIRIES RELATING TO THIS BOND TO THE FOLLOWING ADDRESS:

Arch Insurance – Surety Division  
3 Parkway, Suite 1500  
Philadelphia, PA 19102





# CALIFORNIA ALL- PURPOSE CERTIFICATE OF 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 San Diego }

On JAN 17 2018 before me, Brittany Aceves, Notary Public,  
(Here insert name and title of the officer)

personally appeared Erin A. Greene,  
who proved to me on the basis of satisfactory 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.



Notary Public Signature

(Notary Public Seal)



## ADDITIONAL OPTIONAL INFORMATION

### DESCRIPTION OF THE ATTACHED DOCUMENT

\_\_\_\_\_  
(Title or description of attached document)

\_\_\_\_\_  
(Title or description of attached document continued)

Number of Pages \_\_\_\_\_ Document Date \_\_\_\_\_

### CAPACITY CLAIMED BY THE SIGNER

- Individual (s)  
 Corporate Officer

\_\_\_\_\_  
(Title)

- Partner(s)  
 Attorney-in-Fact  
 Trustee(s)  
 Other \_\_\_\_\_

## INSTRUCTIONS FOR COMPLETING THIS FORM

*This form complies with current California statutes regarding notary wording and, if needed, should be completed and attached to the document. Acknowledgments from other states may be completed for documents being sent to that state so long as the wording does not require the California notary to violate California notary law.*

- State and County information must be the State and County where the document signer(s) personally appeared before the notary public for acknowledgment.
- Date of notarization must be the date that the signer(s) personally appeared which must also be the same date the acknowledgment is completed.
- The notary public must print his or her name as it appears within his or her commission followed by a comma and then your title (notary public).
- Print the name(s) of document signer(s) who personally appear at the time of notarization.
- Indicate the correct singular or plural forms by crossing off incorrect forms (i.e. he/~~she/they~~, is /~~are~~) or circling the correct forms. Failure to correctly indicate this information may lead to rejection of document recording.
- The notary seal impression must be clear and photographically reproducible. Impression must not cover text or lines. If seal impression smudges, re-seal if a sufficient area permits, otherwise complete a different acknowledgment form.
- Signature of the notary public must match the signature on file with the office of the county clerk.
  - ❖ Additional information is not required but could help to ensure this acknowledgment is not misused or attached to a different document.
  - ❖ Indicate title or type of attached document, number of pages and date.
  - ❖ Indicate the capacity claimed by the signer. If the claimed capacity is a corporate officer, indicate the title (i.e. CEO, CFO, Secretary).
- Securely attach this document to the signed document with a staple.

## ATTACHMENTS

**ATTACHMENT A**  
**SCOPE OF WORK**

## **SCOPE OF WORK**

1. **SCOPE OF WORK:** Projects provide renovations to existing facilities that include roof replacement, dorm room reconstruction, new & expanded kitchens, day/training rooms, ready rooms, watch rooms, ADA restroom / bathroom & all associated modifications such as mechanical, electrical, plumbing, HVAC & ADA access.
  - 1.1. The Work shall be performed in accordance with:
    - 1.1.1. The Notice Inviting Bids and Plans numbered **39194-01-D** through **39194-62-D**, **39499-01-D** through **39499-50-D**, and **39500-01-D** through **39500-50-D**, inclusive.
2. **ESTIMATED CONSTRUCTION COST:** The City's estimated construction cost for this project is **\$1,980,300**.
3. **LOCATION OF WORK:** The Location of the Work is as follows:

See **Appendix E**, Location Maps.
4. **CONTRACT TIME:** The Contract Time for completion of the Work shall be **446 Working Days**.

**ATTACHMENT B**  
**PHASED FUNDING PROVISIONS**

## **PHASED FUNDING PROVISIONS**

### **1. PRE-AWARD**

- 1.1.** Within 10 Working Days after the Bid Opening date, the Apparent Low Bidder must contact the Project Manager to discuss fund availability for each phase and shall also submit the following:
  - 1.1.1.** Construction Cost Loaded Schedule in accordance with 6-1, "CONSTRUCTION SCHEDULE AND COMMENCEMENT OF THE WORK" and 9-3, "PAYMENT."
- 1.2.** Your failure to perform any of the following may result cancelling your award of the Contract:
  - 1.2.1.** Meeting with the City's Project Manager to discuss the Phased Funding Schedule.
  - 1.2.2.** Agreeing to a Phased Funding Schedule within 30 Working Days after meeting with the City's Project Manager.

### **2. POST-AWARD**

- 2.1.** Do not start any construction activities for the next phase until the NTP has been issued by the Engineer. The City will issue separate Notice to Proceed (NTP) documents for each phase.
- 2.2.** If requested, the Engineer may issue the NTP for the next phase before the end of the current approved phase.

**PHASED FUNDING SCHEDULE AGREEMENT**

**BID NUMBER:** K-18-1557-DBB-3  
**CONTRACT OR TASK TITLE:** Fire Station Number 3, 8 and 15 Renovations  
**CONTRACTOR:** Billbro Construction Company, Inc.

Funding Phase	Phase Description	Phase Start	Phase Finish	Not-to-Exceed Amount
1	Fire Station 15 Renovations	NTP	Aug 2018	\$ 644,960
2	Fire Station 03 Renovations	Sept 2018	Mar 2019	\$ 1,089,960
3	Fire Station 08 Renovations	Apr 2019	Project Completion	\$ 727,560
Contract Total				\$ 2,462,480

- Notes:
- 1) WHITEBOOK section 9-3.6, "Phased Funding Compensation" applies.
  - 2) The total of all funding phases shall be equal to the TOTAL BID PRICE as shown on BID SCHEDULE 1 - PRICES.
  - 3) This PHASED FUNDING SCHEDULE AGREEMENT will be incorporated into the CONTRACT and shall only be revised by written modifications to the CONTRACT.

**CITY OF SAN DIEGO**

**CONTRACTOR**

PRINT NAME: Tony Pérez  
**Construction Manager**

PRINT NAME: Maryory Contreras

Signature: *Tony Pérez*

Title: President & CEO

Date: 2/12/2018

Signature: *Maryory Contreras*  
Digitally signed by Maryory Contreras  
 DN: cn=Maryory Contreras, o=Billbro Construction Inc, ou=San Diego, c=US  
 Date: 2018.02.09 17:01:08 -0800

PRINT NAME: Marlon Pérez  
**Project Manager**

Date: 02/09/2018

Signature: *Marlon Pérez*

Date: 9 Feb 2018

Name / Title	Jason Grani, Sr Civil Engineer
Signature	<i>Julie Fallsten for Jason Grani</i>
Date	4/3/18

**ATTACHMENT C**  
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**ATTACHMENT D**  
**PREVAILING WAGES**

## ATTACHMENT D

### PREVAILING WAGES

1. **PREVAILING WAGE RATES:** Pursuant to San Diego Municipal Code section 22.3019, construction, alteration, demolition, repair and maintenance work performed under this Contract is subject to State prevailing wage laws. For construction work performed under this Contract cumulatively exceeding \$25,000 and for alteration, demolition, repair and maintenance work performed under this Contract cumulatively exceeding \$15,000, the Contractor and its subcontractors shall comply with State prevailing wage laws including, but not limited to, the requirements listed below.
  - 1.1. **Compliance with Prevailing Wage Requirements.** Pursuant to sections 1720 through 1861 of the California Labor Code, the Contractor and its subcontractors shall ensure that all workers who perform work under this Contract are paid not less than the prevailing rate of per diem wages as determined by the Director of the California Department of Industrial Relations (DIR). This includes work performed during the design and preconstruction phases of construction including, but not limited to, inspection and land surveying work.
    - 1.1.1. Copies of such prevailing rate of per diem wages are on file at the City and are available for inspection to any interested party on request. Copies of the prevailing rate of per diem wages also may be found at <http://www.dir.ca.gov/OPRL/DPreWageDetermination.htm>. Contractor and its subcontractors shall post a copy of the prevailing rate of per diem wages determination at each job site and shall make them available to any interested party upon request.
    - 1.1.2. The wage rates determined by the DIR refer to expiration dates. If the published wage rate does not refer to a predetermined wage rate to be paid after the expiration date, then the published rate of wage shall be in effect for the life of this Contract. If the published wage rate refers to a predetermined wage rate to become effective upon expiration of the published wage rate and the predetermined wage rate is on file with the DIR, such predetermined wage rate shall become effective on the date following the expiration date and shall apply to this Contract in the same manner as if it had been published in said publication. If the predetermined wage rate refers to one or more additional expiration dates with additional predetermined wage rates, which expiration dates occur during the life of this Contract, each successive predetermined wage rate shall apply to this Contract on the date following the expiration date of the previous wage rate. If the last of such predetermined wage rates expires during the life of this Contract, such wage rate shall apply to the balance of the Contract.

- 1.2. Penalties for Violations.** Contractor and its subcontractors shall comply with California Labor Code section 1775 in the event a worker is paid less than the prevailing wage rate for the work or craft in which the worker is employed.
- 1.3. Payroll Records.** Contractor and its subcontractors shall comply with California Labor Code section 1776, which generally requires keeping accurate payroll records, verifying and certifying payroll records, and making them available for inspection. Contractor shall require its subcontractors to also comply with section 1776. Contractor and its subcontractors shall submit weekly certified payroll records online via the City's web-based Labor Compliance Program. Contractor is responsible for ensuring its subcontractors submit certified payroll records to the City.
  - 1.3.1.** For contracts entered into on or after April 1, 2015, Contractor and their subcontractors shall furnish records specified in Labor Code section 1776 directly to the Labor Commissioner in the manner required by Labor Code section 1771.4.
- 1.4. Apprentices.** Contractor and its subcontractors shall comply with California Labor Code sections 1777.5, 1777.6 and 1777.7 concerning the employment and wages of apprentices. Contractor is held responsible for the compliance of their subcontractors with sections 1777.5, 1777.6 and 1777.7.
- 1.5. Working Hours.** Contractor and their subcontractors shall comply with California Labor Code sections 1810 through 1815, including but not limited to: (i) restrict working hours on public works contracts to eight hours a day and forty hours a week, unless all hours worked in excess of 8 hours per day are compensated at not less than 1½ times the basic rate of pay; and (ii) specify penalties to be imposed on design professionals and subcontractors of \$25 per worker per day for each day the worker works more than 8 hours per day and 40 hours per week in violation of California Labor Code sections 1810 through 1815.
- 1.6. Required Provisions for Subcontracts.** Contractor shall include at a minimum a copy of the following provisions in any contract they enter into with a subcontractor: California Labor Code sections 1771, 1771.1, 1775, 1776, 1777.5, 1810, 1813, 1815, 1860 and 1861.
- 1.7. Labor Code Section 1861 Certification.** Contractor in accordance with California Labor Code section 3700 is required to secure the payment of compensation of its employees and by signing this Contract, Contractor certifies that "I am aware of the provisions of Section 3700 of the California 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."

- 1.8. Labor Compliance Program.** The City has its own Labor Compliance Program authorized in August 2011 by the DIR. The City will withhold contract payments when payroll records are delinquent or deemed inadequate by the City or other governmental entity, or it has been established after an investigation by the City or other governmental entity that underpayment(s) have occurred. For questions or assistance, please contact the City of San Diego's Equal Opportunity Contracting Department at 619-236-6000.
- 1.9. Contractor and Subcontractor Registration Requirements.** This project is subject to compliance monitoring and enforcement by the DIR. As of March 1, 2015, no contractor or subcontractor may be listed on a bid or proposal for a public works project unless registered with the DIR pursuant to Labor Code section 1725.5. As of April 1, 2015, a contractor or subcontractor shall not be qualified to bid on, be listed in a bid proposal, or enter into any contract for public work, unless currently registered and qualified to perform public work pursuant to Labor Code section 1725.5. By submitting a bid or proposal to the City, Contractor is certifying that he or she has verified that all subcontractors used on this public work project are registered with the DIR in compliance with Labor Code sections 1771.1 and 1725.5, and Contractor shall provide proof of registration to the City upon request.
- 1.9.1.** A Contractor's inadvertent error in listing a subcontractor who is not registered pursuant to Labor Code section 1725.5 in response to a solicitation shall not be grounds for filing a bid protest or grounds for considering the bid non-responsive provided that any of the following apply: (1) the subcontractor is registered prior to bid opening; (2) within twenty-four hours after the bid opening, the subcontractor is registered and has paid the penalty registration fee specified in Labor Code section 1725.5; or (3) the subcontractor is replaced by another registered subcontractor pursuant to Public Contract Code section 4107.

**ATTACHMENT E**  
**SUPPLEMENTARY SPECIAL PROVISIONS**

## SUPPLEMENTARY SPECIAL PROVISIONS

The following Supplementary Special Provisions (SSP) modifies the following documents:

1. The **2015 Edition** of the Standard Specifications for Public Works Construction (The "GREENBOOK").
2. The **2015 Edition** of the City of San Diego Standard Specifications for Public Works Construction (The "WHITEBOOK"), including the following:
  - a) General Provisions (A) for all Contracts.

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### SECTION 1 – TERMS, DEFINITIONS, ABBREVIATIONS, UNITS OF MEASURE, AND SYMBOLS

- 1-2 TERMS AND DEFINITIONS.** To the "WHITEBOOK", item 54, "Normal Working Hours", ADD the following:

The **Normal Working Hours** are 8:30 AM to 3:30 PM.

### SECTION 2 - SCOPE AND CONTROL OF WORK

- 2-3.2 Self Performance.** To the "GREENBOOK", DELETE in its entirety and SUBSTITUTE with the following:

1. The self-performance percentage requirement will be waived for Prime Contractors meeting the Class B License requirement of this Contract.

- 2-15 TECHNICAL STUDIES AND DATA.** To the "WHITEBOOK", ADD the following:

3. In preparation of the Contract Documents, the designer has relied upon the following reports of explorations and tests at the Work Site:

- a) See Asbestos and Lead **Attachment E Technicals**.

- 2-16 CONTRACTOR REGISTRATION AND ELECTRONIC REPORTING SYSTEM.** To the "WHITEBOOK", item 1, DELETE in its entirety.

## **SECTION 3 – CHANGES IN WORK**

**3-5.1**      **Claims.** To the “WHITEBOOK”, DELETE in its entirety and SUBSTITUTE with the following:

**ADD:**

**3-5.1**      **Claims.**

1.      A Claim is a written demand by you that seeks an adjustment in the Contract Price, Contract Time, or other relief associated with a dispute arising under or relating to the Contract, including a breach of any provision thereof. A voucher, invoice, or other routine request for payment is not a Claim.
2.      A Claim shall conform to these specifications and may be considered after the City has previously denied a request by you for a Change Order seeking the demanded relief.
3.      You shall submit a Claim to the Engineer if a dispute occurs that arises from or relates to the Contract. The Claim shall seek all relief to which you assert you are entitled as a result of the event(s) giving rise to the dispute. Your failure to process a Claim in accordance with these specifications shall constitute a waiver of all relief associated with the dispute. Claims are subject to 6-11, “Right to Audit”.
4.      You shall continue to perform the Services and Work and shall maintain the Schedule during any dispute proceedings. The Engineer will continue to make payments for undisputed Services and Work.
5.      The City's Claims process specified herein shall not relieve you of your statutory obligations to present claims prior to any action under the California Government Code.

**3-5.1.1**      **Initiation of Claim.**

1.      You shall promptly, but no later than 30 Days after the event(s) giving rise to the Claim, deliver the Claim to the Engineer.
2.      You shall not process a Claim unless the Engineer has previously denied a request by you for a Change Order that sought the relief to be pursued in the claim.

**3-5.1.1.1**      **Claim Certification Submittal.**

1.      If your Claim seeks an increase in the Contract Price, the Contract Time, or both, submit with the Claim an affidavit certifying the following:
  - a)      The Claim is made in good faith and covers all costs and delays to which you are entitled as a result of the event(s) giving rise to the Claim.
  - b)      The amount claimed accurately reflects the adjustments in the Contract Price, the Contract Time, or both to which you believe you are entitled.

- c) All supporting costs and pricing data are current, accurate, and complete to the best of your knowledge. The cost breakdown per item of Work shall be supplied.
- d) You shall ensure that the affidavit is executed by an official who has the authority to legally bind you.

**3-5.1.2 Initial Determination.**

- 1. The Engineer will respond in writing to your Claim within 30 Days of receipt of the Claim.

**3-5.1.3 Settlement Meeting.**

- 1. If you disagree with the Initial Determination, you shall request a Settlement Meeting within 30 Days. Upon receipt of this request, the Engineer will schedule the Settlement Meeting within 15 Working Days.

**3-5.1.7 City's Final Determination.**

- 1. If a settle agreement is not reached, the City shall make a written Final Determination within 10 Working Days after the Settlement Meeting.
- 2. If you disagree with the City's Final Determination, notify the Engineer in writing of your objection within 15 Working Days after receipt of the written determination and file a "Request for Mediation" in accordance with 3-5.2, "Dispute Resolution Process".
- 3. Failure to give notice of objection within the 15 Working Days period shall waive your right to pursue the Claim.

**3-5.1.8 Mandatory Assistance.**

- 1. If a third party dispute, litigation, or both arises out of or relates in any way to the Services provided under the Contract, upon the City's request, you shall agree to assist in resolving the dispute or litigation. Your assistance includes, but is not limited to the following:
  - a) Providing professional consultations.
  - b) Attending mediations, arbitrations, depositions, trials, or any event related to the dispute resolution and litigation.

**3-5.1.8.1 Compensation for Mandatory Assistance.**

- 1. The City will reimburse you for reasonable fees and expenses incurred by you for any required assistance rendered in accordance with 3-5.1.8, "Mandatory Assistance" as Extra Work.
- 2. The Engineer will determine whether these fees and expenses were necessary due to your conduct or failure to act.
- 3. If the Engineer determines that the basis of the dispute or litigation in which these fees and expenses were incurred were the result of your conduct or your failure to act in part or in whole, you shall reimburse the City for any payments made for these fees and expenses.



4. Reimbursement may be through any legal means necessary, including the City's withholding of your payment.

**3-5.2.3 Selection of Mediator.** To the "WHITEBOOK", DELETE in its entirety and SUBSTITUTE with the following:

1. A single mediator, knowledgeable in construction aspects and acceptable to both parties, shall be used to mediate the dispute.
2. To initiate mediation, the initiating party shall serve a Request for Mediation at the American Arbitration Association (AAA) on the opposing party.
3. If AAA is used, the initiating party shall concurrently file with AAA a "Request for Mediation" along with the appropriate fees, a copy of requested mediators marked in preference order, and a preference for available dates.
4. If AAA is selected to coordinate the mediation (Administrator), within 10 Working Days from the receipt of the initiating party's Request for Mediation, the opposing party shall file the following:
  - a) A copy of the list of the preferred mediators listed in preference order after striking any mediators to which they have any objection.
  - b) A preference for available dates.
  - c) Appropriate fees.
5. If the parties cannot agree on a mediator, then each party shall select a mediator and those mediators shall select the neutral third party to mediate the matter.

**3-5.3 Forum of Litigation.** To the "WHITEBOOK", DELETE in its entirety and SUBSTITUTE with the following:

1. It is the express intention that all legal actions and proceedings related to the Contract or Agreement with the City or to any rights or any relationship between the parties arising therefrom shall be solely and exclusively initiated and maintained in courts of the State of California for the County of San Diego.

## SECTION 4 - CONTROL OF MATERIALS

**4-1.3.5 Special Inspection.** To the "WHITEBOOK", ADD the following:

5. The payment for special inspection Work specified under this section shall be paid in accordance with 4-1.3.4.1, "Payment".

**4-1.3.6 Preapproved Materials.** To the "WHITEBOOK", ADD the following:

3. You shall submit in writing a list of all products to be incorporated in the Work that are on the AML.

**4-1.6 Trade Names or Equals.** To the "WHITEBOOK", ADD the following:

11. You shall submit your list of proposed substitutions for an "equal" item **no less than 15 Working Days prior to the Bid due date** and on the City's Product Submittal Form available at:

<http://www.sandiego.gov/publicworks/edocref/index.shtml>

## **SECTION 5 - UTILITIES**

**5-2 PROTECTION.** To the "WHITEBOOK", item 2, ADD the following:

- g) Refer to **Appendix H** for more information on the protection of AMI devices.

## **SECTION 6 - PROSECUTION, PROGRESS AND ACCEPTANCE OF WORK**

**6-1.1 Construction Schedule.** To the "WHITEBOOK", item 22, subsection b, DELETE in its entirety and SUBSTITUTE with the following:

- b) A curve value percentage comparison between the Contract Price and the updated cash flow forecast for each Project ID included in the Contract Documents. Curve values shall be set on a scale from 0% to 100% in intervals of 5% of the Contract Time. Refer to the Sample City Invoice materials in the Contract Documents and use the format shown. Your invoice amounts shall be supported by this curve value percentage. For previous periods, use the actual values and percentages and update the curve value percentages accordingly.

**ADD:**

**6-3.2.1.1 Environmental Document.**

1. The City of San Diego has prepared **Notice of Exemptions (NOE)** for **Fire Station No. 3 Roof and HVAC, Fire Station No. 8 Expansion, and Fire Station No. 15 Improvements** as referenced in the Contract Appendix. You shall comply with all requirements of the **NOEs** as set forth in **Appendix A**.
2. Compliance with the City's environmental document shall be included in the Contract Price.

## SECTION 7 - RESPONSIBILITIES OF THE CONTRACTOR

**7-3 INSURANCE.** To the "GREENBOOK", DELETE in its entirety and SUBSTITUTE with the following:

**7-3 INSURANCE.**

1. The insurance provisions herein shall not be construed to limit your indemnity obligations contained in the Contract.

**7-3.1 Policies and Procedures.**

1. You shall procure the insurance described below, at its sole cost and expense, to provide coverage against claims for loss including injuries to persons or damage to property, which may arise out of or in connection with the performance of the Work by you, your agents, representatives, officers, employees or Subcontractors.
2. Insurance coverage for property damage resulting from your operations is on a replacement cost valuation. The market value will not be accepted.
3. You shall maintain this insurance for the duration of this Contract and at all times thereafter when you are correcting, removing, or replacing Work in accordance with this Contract. Your liabilities under the Contract, e.g., your indemnity obligations, is not deemed limited to the insurance coverage required by this Contract.
4. The payment for insurance shall be included in the Contract Price as bid by you. Except as specifically agreed to by the City in writing, you are not entitled to any additional payment. Do not begin any Work under this Contract until you have provided and the City has approved all required insurance.
5. Policies of insurance shall provide that the City is entitled to 30 Days (10 Days for cancellation due to non-payment of premium) prior written notice of cancellation or non-renewal of the policy. Maintenance of specified insurance coverage is a material element of the Contract. Your failure to maintain or renew coverage or to provide evidence of renewal during the term of the Contract may be treated by the City as a material breach of the Contract.

**7-3.2 Types of Insurance.**

**7-3.2.1 Commercial General Liability Insurance.**

1. Commercial General Liability Insurance shall be written on the current version of the ISO Occurrence form CG 00 01 07 98 or an equivalent form providing coverage at least as broad.
2. The policy shall cover liability arising from premises and operations, XCU (explosions, underground, and collapse), independent contractors, products/completed operations, personal injury and advertising injury, bodily injury, property damage, and liability assumed under an insured's contract (including the tort liability of another assumed in a business contract).
3. There shall be no endorsement or modification limiting the scope of coverage for either "insured vs. insured" claims or contractual liability. You shall maintain the same or equivalent insurance for at least 10 years following completion of the Work.
4. All costs of defense shall be outside the policy limits. Policy coverage shall be in liability limits of not less than the following:

<u>General Annual Aggregate Limit</u>	<u>Limits of Liability</u>
Other than Products/Completed Operations	\$2,000,000
Products/Completed Operations Aggregate Limit	\$2,000,000
Personal Injury Limit	\$1,000,000
Each Occurrence	\$1,000,000

**7-3.2.2 Commercial Automobile Liability Insurance.**

1. You shall provide a policy or policies of Commercial Automobile Liability Insurance written on the current version of the ISO form CA 00 01 12 90 or later version or equivalent form providing coverage at least as broad in the amount of \$1,000,000 combined single limit per accident, covering bodily injury and property damage for owned, non-owned, and hired automobiles ("Any Auto").
2. All costs of defense shall be outside the limits of the policy.

**7-3.2.4 Contractors Hazardous Transporters Pollution Liability Insurance.**

1. You shall provide at your expense or require your Subcontractor to provide, as described below, Contractors Hazardous Transporters Pollution Liability Insurance including contractual liability coverage to cover liability arising out of transportation of hazardous or toxic, materials, substances, or any other

pollutants by you or any Subcontractor in an amount not less than \$2,000,000 limit per occurrence/aggregate for bodily injury and property damage.

2. All costs of defense shall be outside the limits of the policy. The deductible shall not exceed \$25,000 per claim. Any such insurance provided by a subcontractor instead of you shall be approved separately in writing by the City.
3. For approval of the substitution of Subcontractor's insurance the Contractor shall certify that all activities for which Contractors Hazardous Transporters Pollution Liability Insurance will provide coverage will be performed exclusively by the Subcontractor providing the insurance.
4. Contractual liability shall include coverage of tort liability of another party to pay for bodily injury or property damage to a third person or organization. There shall be no endorsement or modification of the coverage limiting the scope of coverage for either "insured vs. insured" claims or contractual liability. Occurrence based policies shall be procured before the Work commences and shall be maintained for the duration of this Contract. Claims Made policies shall be procured before the Work commences, shall be maintained for the duration of this contract, and shall include a 12 month extended Claims Discovery Period applicable to this contract or the existing policy or policies that shall continue to be maintained for 12 months after the completion of the Work under this Contract without advancing the retroactive date.
5. Except as provided for under California law, the policy or policies shall provide that the City is entitled to 30 Days prior written notice (10 Days for cancellation due to non-payment of premium) of cancellation or non-renewal of the policy or policies.

#### **7-3.2.5 Contractors Builders Risk Property Insurance..**

1. You shall provide at your expense, and maintain until Final Acceptance of the Work, a Special Form Builders Risk Policy or Policies. This insurance shall be in an amount equal to the replacement cost of the completed Work (without deduction for depreciation) including the cost of excavations, grading, and filling. The policy or policies limits shall be 100% of this Contract value of the Work plus 15% to cover administrative costs, design costs, and the costs of inspections and construction management.
2. Insured property shall include material or portions of the Work located away from the Site but intended for use at the Site and shall cover material or portions of the Work in transit. The policy or policies shall include as insured

property scaffolding, falsework, and temporary buildings located at the Site. The policy or policies shall cover the cost of removing debris, including demolition.

3. The policy or policies shall provide that all proceeds thereunder shall be payable to the City as Trustee for the insured, and shall name the City, the Contractor, Subcontractors, and Suppliers of all tiers as named insured. The City, as Trustee, will collect, adjust, and receive all monies which may become due and payable under the policy or policies, may compromise any and all claims thereunder, and will apply the proceeds of such insurance to the repair, reconstruction, or replacement of the Work.
4. Any deductible applicable to the insurance shall be identified in the policy or policies documents and responsibility for paying the part of any loss not covered because of the application of such deductibles shall be apportioned among the parties except for the City as follows: if there is more than one claimant for a single occurrence, then each claimant shall pay a pro-rata share of the per occurrence deductible based upon the percentage of their paid claim to the total paid for insured. The City shall be entitled to 100% of its loss. You shall pay the City any portion of that loss not covered because of a deductible at the same time the proceeds of the insurance are paid to the City as trustee.
5. Any insured, other than the City, making claim to which a deductible applies shall be responsible for 100% of the loss not insured because of the deductible. Except as provided for under California law, the policy or policies shall provide that the City is entitled to 30 Days prior written notice (10 Days for cancellation due to non-payment of premium) of cancellation or non-renewal of the policy or policies.

**7-3.3 Rating Requirements.** Except for the State Compensation Insurance Fund, all insurance required by this Contract as described herein shall be carried only by responsible insurance companies with a rating of, or equivalent to, at least "A-, VI" by A.M. Best Company, that are authorized by the California Insurance Commissioner to do business in the State, and that have been approved by the City.

**7-3.3.1 Non-Admitted Carriers.** The City will accept insurance provided by non-admitted, "surplus lines" carriers only if the carrier is authorized to do business in the State and is included on the List of Approved Surplus Lines Insurers (LASLI list).

All policies of insurance carried by non-admitted carriers shall be subject to all of the requirements for policies of insurance provided by admitted carriers described herein.

**7-3.4 Evidence of Insurance.** Furnish to the City documents e.g., certificates of insurance and endorsements evidencing the insurance required herein, and furnish renewal documentation prior to expiration of this insurance. Each required document shall be signed by the insurer or a person authorized by the insurer to bind coverage on its behalf. We reserve the right to require complete, certified copies of all insurance policies required herein.

**7-3.5 Policy Endorsements.**

**7-3.5.1 Commercial General Liability Insurance.**

**7-3.5.1.1 Additional Insured.**

1. You shall provide at your expense policy endorsement written on the current version of the ISO Occurrence form CG 20 10 11 85 or an equivalent form providing coverage at least as broad.
2. To the fullest extent allowed by law e.g., California Insurance Code §11580.04, the policy shall be endorsed to include the City and its respective elected officials, officers, employees, agents, and representatives as additional insured.
3. The additional insured coverage for projects for which the Engineer's Estimate is \$1,000,000 or more shall include liability arising out of:
  - a) Ongoing operations performed by you or on your behalf,
  - b) your products,
  - c) your Work, e.g., your completed operations performed by you or on your behalf, or
  - d) premises owned, leased, controlled, or used by you.
4. The additional insured coverage for projects for which the Engineer's Estimate is less than \$1,000,000 shall include liability arising out of:
  - a) Ongoing operations performed by you or on your behalf,
  - b) your products, or
  - c) premises owned, leased, controlled, or used by you.

**7-3.5.1.2 Primary and Non-Contributory Coverage.** The policy shall be endorsed to provide that the coverage with respect to operations, including the completed operations, if appropriate, of the Named Insured is primary to any insurance or self-insurance of the City and its elected officials, officers, employees, agents and representatives. Further, it shall provide that any insurance maintained by the City and its elected officials, officers, employees, agents and representatives shall be in excess of your insurance and shall not contribute to it.

**7-3.5.1.3 Project General Aggregate Limit.** The policy or policies shall be endorsed to provide a Designated Construction Project General Aggregate Limit that will apply only to the Work. Only claims payments which arise from the Work shall reduce the Designated Construction Project General Aggregate Limit. The Designated Construction Project General Aggregate Limit shall be in addition to the aggregate limit provided for the products-completed operations hazard.

**7-3.5.2 Commercial Automobile Liability Insurance.**

**7-3.5.2.1 Additional Insured.** Unless the policy or policies of Commercial Auto Liability Insurance are written on an ISO form CA 00 01 12 90 or a later version of this form or equivalent form providing coverage at least as broad, the policy shall be endorsed to include the City and its respective elected officials, officers, employees, agents, and representatives as additional insured, with respect to liability arising out of automobiles owned, leased, hired or borrowed by you or on your behalf. This endorsement is limited to the obligations permitted by California Insurance Code §11580.04.

**7-3.5.4 Contractors Hazardous Transporters Pollution Liability Insurance Endorsements.**

**7-3.5.4.1 Additional Insured.**

1. The policy or policies shall be endorsed to include as an Insured the City and its respective elected officials, officers, employees, agents, and representatives, with respect to liability arising out of:
  - a) Ongoing operations performed by you or on your behalf,
  - b) your products,
  - c) your work, e.g., your completed operations performed by you or on your behalf, or
  - d) premises owned, leased, controlled, or used by you.

Except that in connection with, collateral to, or affecting any construction contract to which the provisions of subdivision (b) of §2782 of the California Civil Code apply, this endorsement shall not provide any duty of indemnity coverage for the active negligence of the City and its respective elected officials, officers, employees, agents, and representatives in any case where an agreement to indemnify the City and its respective elected officials, officers, employees, agents, and representatives would be invalid under subdivision (b) of §2782 of the California Civil Code.



2. In any case where a claim or loss encompasses the negligence of the Insured and the active negligence of the City and its respective elected officials, officers, employees, agents, and representatives that are not covered because of California Insurance Code §11580.04, the insurer's obligation to the City and its respective elected officials, officers, employees, agents, and representatives shall be limited to obligations permitted by California Insurance Code §11580.04.

**7-3.5.4.2 Primary and Non-Contributory Coverage.** The policy or policies shall be endorsed to provide that the insurance afforded by the Contractors Pollution Liability Insurance policy or policies is primary to any insurance or self-insurance of the City and its elected officials, officers, employees, agents and representatives with respect to operations including the completed operations of the Named Insured. Any insurance maintained by the City and its elected officials, officers, employees, agents and representatives shall be in excess of your insurance and shall not contribute to it.

**7-3.5.4.3 Severability of Interest.** For Contractors Hazardous Transporters Pollution Liability Insurance, the policy or policies shall provide that your insurance shall apply separately to each insured against whom claim is made or suit is brought, except with respect to the limits of the insurer's liability and shall provide cross-liability coverage.

**7-3.5.5 Builders Risk Endorsements.**

**7-3.5.5.1 Waiver of Subrogation.** The policy or policies shall be endorsed to provide that the insurer will waive all rights of subrogation against the City, and its respective elected officials, officers, employees, agents, and representatives for losses paid under the terms of the policy or policies and which arise from Work performed by the Named Insured for the City.

**7-3.5.5.2 Builders Risk - Partial Utilization.** If the City desires to occupy or use a portion or portions of the Work prior to Acceptance in accordance with this Contract, the City will notify you and you shall immediately notify your Builder's Risk insurer and obtain an endorsement that the policy or policies shall not be cancelled or lapse on account of any such partial use or occupancy. You shall obtain the endorsement prior to the City's occupation and use.

**7-3.6 Deductibles and Self-Insured Retentions.** You shall pay for all deductibles and self-insured retentions. You shall disclose deductibles and self-insured retentions to the City at the time the evidence of insurance is provided.

**7-3.7 Reservation of Rights.** The City reserves the right, from time to time, to review your insurance coverage, limits, deductibles and self-insured retentions to determine if they are acceptable to the City. The City will reimburse you, without overhead, profit,

or any other markup, for the cost of additional premium for any coverage requested by the Engineer but not required by this Contract.

**7-3.8 Notice of Changes to Insurance.** You shall notify the City 30 Days prior to any material change to the policies of insurance provided under this Contract.

**7-3.9 Excess Insurance.** Policies providing excess coverage shall follow the form of the primary policy or policies e.g., all endorsements.

**7-4 NOT USED.** DELETE in its entirety and SUBSTITUTE with the following:

**7-4 WORKERS' COMPENSATION INSURANCE AND EMPLOYERS LIABILITY INSURANCE.**

1. In accordance with the provisions of §3700 of the California Labor Code, you shall provide at your expense Workers' Compensation Insurance and Employers Liability Insurance to protect you against all claims under applicable state workers compensation laws. The City, its elected officials, and employees will not be responsible for any claims in law or equity occasioned by your failure to comply with the requirements of this section.

2. Limits for this insurance shall be not less than the following:

<u>Workers' Compensation</u>	<u>Statutory Employers Liability</u>
Bodily Injury by Accident	\$1,000,000 each accident
Bodily Injury by Disease	\$1,000,000 each employee
Bodily Injury by Disease	\$1,000,000 policy limit

3. By signing and returning the Contract you certify that you are aware of the provisions of §3700 of the Labor Code which requires 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 you shall comply with such provisions before commencing the Work as required by §1861 of the California Labor Code.

**7-4.1. Waiver of Subrogation.** The policy or policies shall be endorsed to provide that the insurer will waive all rights of subrogation against the City and its respective elected officials, officers, employees, agents, and representatives for losses paid under the terms of the policy or policies and which arise from Work performed by the Named Insured for the City.

**7-8.6 Water Pollution Control.** To the "WHITEBOOK", ADD the following:

6. Based on a preliminary assessment by the City, this Contract is subject to **WPCP.**

**7-20 ELECTRONIC COMMUNICATION.** To the "WHITEBOOK", ADD the following:

2. Virtual Project Manager shall be used on this Contract.

**7-21.1 General.** To the "WHITEBOOK", item 3, DELETE in its entirety and SUBSTITUTE with the following:

3. During the construction phase of projects, the minimum waste management reduction goal is 90% of the inert material (a material not subject to decomposition such as concrete, asphalt, brick, rock, block, dirt, metal, glass, and etc.) and 65% of the remaining project waste. You shall provide appropriate documentation, including a Waste Management Form attached as an appendix, and evidence of recycling and reuse of materials to meet the waste reduction goals specified.

## **SECTION 9 - MEASUREMENT AND PAYMENT**

**9-3.2 Partial and Final Payment.** To the "GREENBOOK", paragraph (3), DELETE in its entirety and SUBSTITUTE with the following:

Upon commencement of the Work, an escrow account shall be established in a financial institution chosen by you and approved by the City. Documentation for an escrow payment shall have an escrow agreement signed by you, the City, and the escrow agent. From each progress payment, no less than 5% will be deducted and deposited by the City into the escrow account. Upon completion of the Contract, the City will notify the Escrow agent in writing to release the funds to you. Only the designated representative of the City shall sign the request for the release of Escrow funds.

**ADD:**

**9-3.7 Compensation Adjustments for Price Index Fluctuations.** To the "WHITEBOOK" ADD the following:

5. This Contract **is not** subject to the provisions of The "WHITEBOOK" for Compensation Adjustments for Price Index Fluctuations for paving asphalt.

## **SECTION 304 -METAL FABRICATION AND CONSTRUCTION**

**304-5 PAYMENT.** To the "WHITEBOOK", REVISE section "304-5" to "304-6".

## **EQUAL OPPORTUNITY CONTRACTING PROGRAM (EOCP) SECTION A – GENERAL REQUIREMENTS**

- 4.1 Nondiscrimination in Contracting Ordinance.** To the “WHITEBOOK”, subsection 4.1.1, paragraph (2), sentence (1), DELETE in its entirety and SUBSTITUTE with the following:

You shall not discriminate on the basis of race, gender, gender expression, gender identity, religion, national origin, ethnicity, sexual orientation, age, or disability in the solicitation, selection, hiring, or treatment of subcontractors, vendors, or suppliers.

**END OF SUPPLEMENTARY SPECIAL PROVISIONS (SSP)**

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# SPECIFICATIONS

The City of San Diego

Fire Station Number 3 Renovations  
Fire Station Number 8 Renovations  
Fire Station Number 15 Renovations

Bid Issue

JANUARY 18, 2017



Kitchell CEM  
4719 Viewridge Drive, Unit 130,  
San Diego, CA 92123

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## SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

#### 1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.
- B. W/C Ratio: The ratio by weight of water to cementitious materials.

#### 1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
  - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
  - 2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.

#### 1.5 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
  - 3. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
  - 4. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.



5. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- B. Hot-Weather Placement: Comply with ACI 301 and as follows:
1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
  2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

## **PART 2 - PRODUCTS**

### **2.1 CONCRETE, GENERAL**

- A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
1. ACI 301.
  2. ACI 117.

### **2.2 CONCRETE MIXTURES, GENERAL**

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.

## **PART 3 - EXECUTION**

### **3.1 FORMWORK INSTALLATION**

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Construct forms tight enough to prevent loss of concrete mortar.



- D. Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
  - 1. Install keyways, reglets, recesses, and the like, for easy removal.
  - 2. Do not use rust-stained steel form-facing material.
- E. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- F. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- G. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- H. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- I. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- J. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

### 3.2 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.
  - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
  - 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material are not acceptable for exposed surfaces. Apply new form-release agent.



- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by City.

### 3.3 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by City.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
  - 1. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
  - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
  - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

### 3.4 MISCELLANEOUS CONCRETE ITEM INSTALLATION

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

### 3.5 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by City. Remove and replace concrete that cannot be repaired and patched to City's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.





- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
  2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar matches surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
  3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by City.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
  2. After concrete has cured at least 14 days, correct high areas by grinding.
  3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
  4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
  5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
  6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.



7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to City's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to City's approval.

**END OF SECTION 03 30 00**



## SECTION 04 22 00 - CONCRETE UNIT MASONRY

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

#### 1.3 FIELD CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
  - 1. Extend cover a minimum of 24 inches down both sides of walls, and hold cover securely in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.



1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
  2. Protect sills, ledges, and projections from mortar droppings.
  3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
  4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

### **2.2 UNIT MASONRY, GENERAL**

- A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6 except as modified by requirements in the Contract Documents.
- B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work.
- C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.
  1. Where fire-resistance-rated construction is indicated, units shall be listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.

## **PART 3 – EXECUTION**

### **3.1 EXAMINATION**

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.



1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
  2. Verify that foundations are within tolerances specified.
  3. Verify that substrates are free of substances that would impair mortar bond.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION, GENERAL

- A. Build chases and recesses to accommodate items specified in this and other Sections.
- B. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.
- C. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

### 3.3 TOLERANCES

- A. Dimensions and Locations of Elements:
1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
  2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
  3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.
- B. Lines and Levels:
1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
  2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
  3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
  4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.



5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- E. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- F. Fill all cores in hollow CMUs with grout unless otherwise indicated.

3.5 MORTAR BEDDING AND JOINTING

- A. Rake out mortar joints at pre-faced CMUs to a uniform depth of 1/4 inch and point with epoxy mortar to comply with epoxy-mortar manufacturer's written instructions.



- B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
- C. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.
- D. Cut joints flush where indicated to receive waterproofing unless otherwise indicated.

**3.6 REPAIRING, POINTING, AND CLEANING**

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
  - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
  - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain City's approval of sample cleaning before proceeding with cleaning of masonry.
  - 3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
  - 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
  - 5. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.

**3.7 MASONRY WASTE DISPOSAL**

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
- B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
  - 1. Crush masonry waste to less than 4 inches in each dimension.



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2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste.
  3. Do not dispose of masonry waste as fill within 18 inches of finished grade.
- C. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.
- D. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off City's property.

**END OF SECTION 04 22 00**





## SECTION 06 10 00 - ROUGH CARPENTRY

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:

1. Framing with dimension lumber.
2. Framing with timber.
3. Framing with engineered wood products.
4. Shear wall panels.
5. Rooftop equipment bases and support curbs.
6. Wood blocking, cants, and nailers.
7. Wood furring.
8. Wood sleepers.
9. Plywood backing panels.

- B. Related Requirements:

1. Section 06 16 00 "Sheathing" for sheathing, subflooring, and underlayment.

#### 1.3 DEFINITIONS

- A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.
- B. Dimension Lumber: Lumber of 2 inches nominal size or greater but less than 5 inches nominal size in least dimension.
- C. Exposed Framing: Framing not concealed by other construction.
- D. OSB: Oriented strand board.
- E. Timber: Lumber of 5 inches nominal size or greater in least dimension.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.



1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.
- B. Evaluation Reports: For the following, from ICC-ES:
  1. Wood-preservative-treated wood.
  2. Fire-retardant-treated wood.
  3. Engineered wood products.
  4. Power-driven fasteners.
  5. Post-installed anchors.
  6. Metal framing anchors.

#### 1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.



**PART 2 - PRODUCTS**

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
  - 1. Factory mark each piece of lumber with grade stamp of grading agency.
  - 2. Dress lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.
- C. Engineered Wood Products: Acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
  - 1. Allowable design stresses, as published by manufacturer, shall meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.
  - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
  - 2. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat items indicated on Drawings, and the following:
  - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
  - 2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
  - 3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.



- 4. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
- 5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
  - 1. Treatment shall not promote corrosion of metal fasteners.
  - 2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
  - 3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
  - 4. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D 5664 and design value adjustment factors shall be calculated according to ASTM D 6841.
- C. Kiln-dry lumber after treatment to maximum moisture content of 19 percent.
- D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.
- E. Application: Treat items indicated on Drawings, and the following:
  - 1. Framing for raised platforms.
  - 2. Concealed blocking.
  - 3. Framing for non-load-bearing partitions.
  - 4. Framing for non-load-bearing exterior walls.
  - 5. Roof construction.
  - 6. Plywood backing panels.

2.4 DIMENSION LUMBER FRAMING

- A. Non-Load-Bearing Interior Partitions: Construction or No. 2 grade.
  - 1. Application: Interior partitions not indicated as load bearing.



- 2. Species:
  - a. Douglas fir-larch; WCLIB or WWPA.

2.5 TIMBER FRAMING

- A. Comply with the following requirements, according to grading rules of grading agency indicated:
  - 1. Species and Grade: Douglas fir-larch, Douglas fir-larch (north), or Douglas fir-south; No. 1 grade; NLGA, WCLIB, or WWPA.

2.6 ENGINEERED WOOD PRODUCTS

- A. Source Limitations: Obtain each type of engineered wood product from single source from a single manufacturer.

2.7 SHEAR WALL PANELS

- A. Wood-Framed Shear Wall Panels: Prefabricated assembly consisting of wood perimeter framing, tie downs, and Exposure I, Structural I plywood or OSB sheathing.
- B. Allowable design loads, as published by manufacturer, shall meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.8 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
  - 1. Blocking.
  - 2. Nailers.
  - 3. Rooftop equipment bases and support curbs.
  - 4. Cants.
  - 5. Furring.
- B. Dimension Lumber Items: Construction or No. 2 grade lumber of the following species:
  - 1. Douglas fir-larch; WCLIB or WWPA.
- C. Concealed Boards: 19 percent maximum moisture content and the following species and grades:
  - 1. Douglas fir-larch; Construction or No. 2 Common grade; WCLIB or WWPA.
- D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.



- E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
- F. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

**2.9 PLYWOOD BACKING PANELS**

- A. Equipment Backing Panels: Plywood, DOC PS 1, Exposure 1, C-D Plugged, in thickness indicated or, if not indicated, not less than 1/2-inch nominal thickness.

**2.10 FASTENERS**

- A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture.
  - 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193 or ICC-ES AC308 as appropriate for the substrate.
  - 1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
  - 2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

**2.11 METAL FRAMING ANCHORS**

- A. Allowable design loads, as published by manufacturer, shall meet or exceed those of products of manufacturers listed. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Framing anchors shall be punched for fasteners adequate to withstand same loads as framing anchors.
- B. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.
  - 1. Use for interior locations unless otherwise indicated.



- C. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A 653/A 653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.
  - 1. Use for wood-preservative-treated lumber and where indicated.
- D. Stainless-Steel Sheet: ASTM A 666, Type 316.
  - 1. Use for exterior locations and where indicated.
- E. Joist Hangers: U-shaped joist hangers with 2-inch- long seat and 1-1/4-inch- wide nailing flanges at least 85 percent of joist depth.
  - 1. Thickness: 0.062 inch.
- F. Bridging: Rigid, V-section, nailless type, 0.050 inch thick, length to suit joist size and spacing.
- G. Post Bases: Adjustable-socket type for bolting in place with standoff plate to raise post 1 inch above base and with 2-inch- minimum side cover, socket 0.062 inch thick, and standoff and adjustment plates 0.108 inch thick.
- H. Hold-Downs: Brackets for bolting to wall studs and securing to foundation walls with anchor bolts or to other hold-downs with threaded rods and designed with first of two bolts placed seven bolt diameters from reinforced base.

2.12 MISCELLANEOUS MATERIALS

- A. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch.
- B. Adhesives for Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.
- C. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chloropyrifos as its active ingredient.

**PART 3 - EXECUTION**

3.1 INSTALLATION, GENERAL

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.



- C. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- D. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels.
- E. Install shear wall panels to comply with manufacturer's written instructions.
- F. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- G. Do not splice structural members between supports unless otherwise indicated.
- H. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
  - 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.
- I. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
  - 1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
  - 2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal thickness.
  - 3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. and to solidly fill space below partitions.
  - 4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet o.c.
- J. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- K. Comply with AWWA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
  - 1. Use inorganic boron for items that are continuously protected from liquid water.
  - 2. Use copper naphthenate for items not continuously protected from liquid water.
- L. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.





- M. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
  - 1. Table 2304.10.1 "Fastening Schedule," in California Building Code (CBC).
  - 2. ICC-ES evaluation report for fastener.
- N. Use steel 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. Drive nails snug but do not countersink nail heads unless otherwise indicated.
- O. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.
  - 1. Comply with indicated fastener patterns where applicable. Before fastening, mark fastener locations, using a template made of sheet metal, plastic, or cardboard.
  - 2. Use common nails unless otherwise indicated. Drive nails snug but do not countersink nail heads.

**3.2 WOOD BLOCKING, AND NAILER INSTALLATION**

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

**3.3 WOOD FURRING INSTALLATION**

- A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.
- B. Furring to Receive Plywood or Hardboard Paneling: Install 1-by-3-inch nominal- size furring vertically at 24 inches o.c.
- C. Furring to Receive Gypsum Board: Install 1-by-2-inch nominal- size furring vertically at 16 inches o.c.

**3.4 WALL AND PARTITION FRAMING INSTALLATION**

- A. General: Provide single bottom plate and double top plates using members of 2-inch nominal thickness whose widths equal that of studs, except single top plate may be used for non-load-bearing partitions. Fasten plates to supporting construction unless otherwise indicated.
- B. Construct corners and intersections with three or more studs, except that two studs may be used for interior non-load-bearing partitions.



- C. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Support headers on jamb studs.

**3.5 FLOOR JOIST FRAMING INSTALLATION**

- A. General: Install floor joists with crown edge up and support ends of each member with not less than 1-1/2 inches of bearing on wood or metal, or 3 inches on masonry. Attach floor joists as follows:
  - 1. Where supported on wood members, by using metal framing anchors.
  - 2. Where framed into wood supporting members, by using wood ledgers as indicated or, if not indicated, by using metal joist hangers.
- B. Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds 48 inches.
- C. Do not notch in middle third of joists; limit notches to one-sixth depth of joist, one-third at ends. Do not bore holes larger than one-third depth of joist; do not locate closer than 2 inches from top or bottom.
- D. Provide solid blocking of 2-inch nominal thickness by depth of joist at ends of joists unless nailed to header or band.
- E. Lap members framing from opposite sides of beams, girders, or partitions not less than 4 inches or securely tie opposing members together. Provide solid blocking of 2-inch nominal thickness by depth of joist over supports.
- F. Provide solid blocking between joists under jamb studs for openings.
- G. Under non-load-bearing partitions, provide double joists separated by solid blocking equal to depth of studs above.

**3.6 CEILING JOIST AND RAFTER FRAMING INSTALLATION**

- A. Ceiling Joists: Install with crown edge up and complying with requirements specified above for floor joists. Face nail to ends of parallel rafters.
- B. Rafters: Notch to fit exterior wall plates and use metal framing anchors. Double rafters to form headers and trimmers at openings in roof framing, if any, and support with metal hangers. Where rafters abut at ridge, place directly opposite each other and nail to ridge member or use metal ridge hangers.
  - 1. At valleys, provide double-valley rafters of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against valley rafters.
  - 2. At hips, provide hip rafter of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against hip rafter.
- C. Provide special framing as indicated for eaves, overhangs, dormers, and similar conditions if any.



**3.7 TIMBER FRAMING INSTALLATION**

- A. Install timber beams with crown edge up and provide not less than 4 inches of bearing on supports. Provide continuous members unless otherwise indicated; tie together over supports as indicated if not continuous.
- B. Install wood posts using metal anchors indicated.
- C. Treat ends of timber beams and posts exposed to weather by dipping in water-repellent preservative for 15 minutes.

**3.8 PROTECTION**

- A. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet enough that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

**END OF SECTION 06 10 00**



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**SECTION 06 16 00 - SHEATHING**

**PART 1 - GENERAL**

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Wall sheathing.
2. Roof sheathing.
3. Parapet sheathing.
4. Underlayment.
5. Sheathing joint and penetration treatment.

B. Related Requirements:

1. Section 06 10 00 "Rough Carpentry" for plywood backing panels.
2. Section 07 25 00 "Weather Barriers" for water-resistive barrier applied over wall sheathing.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
3. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5516.
4. For products receiving waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.4 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES:



1. Wood-preservative-treated plywood.
2. Fire-retardant-treated plywood.

#### 1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance Ratings: As tested according to ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

#### 2.2 WOOD PANEL PRODUCTS

- A. Emissions: Products shall meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.
- C. Factory mark panels to indicate compliance with applicable standard.

#### 2.3 PRESERVATIVE-TREATED PLYWOOD

- A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.



1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
- C. Application: Treat items indicated on Drawings and plywood in contact with masonry or concrete or used with roofing, flashing, vapor barriers, and waterproofing.

#### 2.4 FIRE-RETARDANT-TREATED PLYWOOD

- A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
  1. Use treatment that does not promote corrosion of metal fasteners.
  2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
  3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201/D 3201M at 92 percent relative humidity. Use where exterior type is not indicated.
  4. Design Value Adjustment Factors: Treated lumber plywood shall be tested according to ASTM D 5516 and design value adjustment factors shall be calculated according to ASTM D 6305. Span ratings after treatment shall be not less than span ratings specified. For roof sheathing and where high-temperature fire-retardant treatment is indicated, span ratings for temperatures up to 170 deg F shall be not less than span ratings specified.
- C. Kiln-dry material after treatment to a maximum moisture content of 15 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- D. Identify fire-retardant-treated plywood with appropriate classification marking of qualified testing agency.
- E. Application: Treat plywood indicated on Drawings, and the following:
  1. Roof and wall sheathing within 48 inches of fire walls.

#### 2.5 WALL SHEATHING

- A. Plywood Sheathing: Either DOC PS 1 or DOC PS 2, Exterior, Structural I sheathing.



- 1. Span Rating: Not less than 24/0.
- 2. Nominal Thickness: Not less than 1/2 inch.

B. Oriented-Strand-Board Sheathing: DOC PS 2, Exposure 1, Structural I sheathing.

- 1. Span Rating: Not less than 24/0.
- 2. Nominal Thickness: Not less than 1/2 inch.

2.6 ROOF SHEATHING

A. Plywood Sheathing: Either DOC PS 1 or DOC PS 2, Exterior, Structural I sheathing.

- 1. Span Rating: Not less than 24/0.
- 2. Nominal Thickness: Not less than 1/2 inch.

B. Oriented-Strand-Board Sheathing: DOC PS 2, Exposure 1, Structural I sheathing.

- 1. Span Rating: Not less than 24/16.
- 2. Nominal Thickness: Not less than 1/2 inch.

2.7 PARAPET SHEATHING

A. Plywood Sheathing: Either DOC PS 1 or DOC PS 2, Exterior, Structural I sheathing.

- 1. Span Rating: Not less than 24/0.
- 2. Nominal Thickness: Not less than 1/2 inch.

B. Oriented-Strand-Board Sheathing: DOC PS 2, Exposure 1, Structural I sheathing.

- 1. Span Rating: Not less than 24/16.
- 2. Nominal Thickness: Not less than 1/2 inch.

2.8 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

- 1. For roof parapet and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

D. Screws for Fastening Sheathing to Wood Framing: ASTM C 1002.





2.9 MISCELLANEOUS MATERIALS

- A. Adhesives for Field Gluing Panels to Wood Framing: Formulation complying with APA AFG-01 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.

**PART 3 - EXECUTION**

3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
  - 1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
  - 2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in the ICC's International Residential Code for One- and Two-Family Dwellings.
  - 3. ICC-ES evaluation report for fastener.
- D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.
- E. Coordinate wall parapet and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

**END OF SECTION 06 16 00**



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## SECTION 06 18 00 - GLUED-LAMINATED CONSTRUCTION

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section includes framing using structural glued-laminated timber.

#### 1.3 DEFINITIONS

- A. Structural Glued-Laminated (Glulam) Timber: An engineered, stress-rated timber product assembled from selected and prepared wood laminations bonded together with adhesives and with the grain of the laminations approximately parallel longitudinally.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. General: Comply with provisions in AITC 111.
- B. Individually wrap members using plastic-coated paper covering with water-resistant seams.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. RedBuilt.
  - 2. Rosboro.
  - 3. Boise Cascade.



2.2 STRUCTURAL GLUED-LAMINATED TIMBER

- A. General: Provide structural glued-laminated timber that complies with AITC A190.1 and AITC 117 or research/evaluation reports acceptable to authorities having jurisdiction.
  - 1. Factory mark each piece of structural glued-laminated timber with AITC Quality Mark or APA-EWS trademark. Place mark on surfaces that are not exposed in the completed Work.
  - 2. Provide structural glued-laminated timber made from single species.
  - 3. Provide structural glued-laminated timber made from solid lumber laminations; do not use laminated veneer lumber.
  - 4. Provide structural glued-laminated timber made with wet-use adhesive complying with AITC A190.1.
- B. Appearance Grade: Framing, complying with AITC 110.

2.3 FABRICATION

- A. Camber: Fabricate horizontal and inclined members of less than 1:1 slope with either circular or parabolic camber equal to 1/500 of span.
- B. Where preservative-treated members are indicated, fabricate (cut, drill, surface, and sand) before treatment to greatest extent possible. Where fabrication must be done after treatment, apply a field-treatment preservative to comply with AWPA M4.
  - 1. Use inorganic boron (SBX) treatment for members not in contact with the ground and continuously protected from liquid water.
  - 2. Use copper naphthenate treatment for members in contact with the ground or not continuously protected from liquid water.

**PART 3 - EXECUTION**

3.1 EXAMINATION

- C. Examine substrates in areas to receive structural glued-laminated timber, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Erect structural glued-laminated timber true and plumb and with uniform, close-fitting joints. Provide temporary bracing to maintain lines and levels until permanent supporting members are in place.



1. Handle and temporarily support glued-laminated timber to prevent surface damage, compression, and other effects that might interfere with indicated finish.
  - B. Framing Built into Masonry: Provide 1/2-inch clearance at tops, sides, and ends of members built into masonry; bevel cut ends 3 inches; and do not embed more than 4 inches unless otherwise indicated.
  - C. Cutting: Avoid extra cutting after fabrication. Where field fitting is unavoidable, comply with requirements for shop fabrication.
  - D. Install timber connectors as indicated.
    1. Unless otherwise indicated, install bolts with same orientation within each connection and in similar connections.
    2. Install bolts with orientation as indicated or, if not indicated, as directed by City.
- 3.3 ADJUSTING
- A. Repair damaged surfaces after completing erection. Replace damaged structural glued-laminated timber if repairs are not approved by City.
- 3.4 PROTECTION
- A. Do not remove wrappings on individually wrapped members until they no longer serve a useful purpose, including protection from weather, sunlight, soiling, and damage from work of other trades.
    1. Coordinate wrapping removal with finishing work. Retain wrapping where it can serve as a painting shield.
    2. Slit underside of wrapping to prevent accumulation of moisture inside the wrapping.

**END OF SECTION 06 18 00**



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## SECTION 06 41 16 - PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver cabinets until painting and similar operations that could damage woodwork have been completed in installation areas. If cabinets must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

#### 1.3 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during the remainder of the construction period.
- C. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
  - 1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed, and indicate measurements on Shop Drawings.
- D. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

#### 1.4 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that cabinets can be supported and installed as indicated.



## PART 2 - PRODUCTS

### 2.1 ARCHITECTURAL CABINET FABRICATORS

- A. Fabricators: Subject to compliance with requirements
- B. See AWI's or WI's member list for names of woodworking firms.

### 2.2 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural plastic-laminate cabinets indicated for construction, finishes, installation, and other requirements.
- B. Grade: Custom.
- C. Type of Construction: Frameless.
- D. Cabinet, Door, and Drawer Front Interface Style: Flush overlay.
- E. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by woodwork quality standard.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. Abet Laminati, Inc.
    - b. Formica Corporation.
    - c. Lamin-Art, Inc.
    - d. Panolam Industries International, Inc.
    - e. Wilsonart International; Div. of Premark International, Inc.
  - 2. Laminate colors: Selected from manufacturers standard range.
- F. Laminate Cladding for Exposed Surfaces:
  - 1. Edges: PVC edge banding, 0.12 inch thick, matching laminate in color, pattern, and finish.
  - 2. Pattern Direction: Vertically for drawer fronts, doors, and fixed panels.
- G. Materials for Semiexposed Surfaces:
  - 1. Surfaces Other Than Shelves and Drawer Bodies: High-pressure decorative laminate, NEMA LD 3, Grade CLS .
    - a. Edges of Plastic-Laminate Shelves: PVC edge banding, 0.12 inch thick, matching laminate in color, pattern, and finish.
    - b. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, NEMA LD 3, Grade VGS.
  - 2. Shelves: Plywood with High Pressure Decorative Laminate.
  - 3. Drawer Sides and Backs: Thermoset decorative panels with PVC or polyester edge banding.
  - 4. Drawer Bottoms: Hardwood plywood.
- H. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.





- I. **Drawer Construction:** Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
  - 1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners.
- J. **Colors, Patterns, and Finishes:** Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
  - 1. As indicated by laminate manufacturer's designations.
  - 2. Match City's sample.
  - 3. As selected by City from laminate manufacturer's full range in the following categories:
    - a. Wood grains, matte finish.
    - b. Patterns, matte finish.

### 2.3 WOOD MATERIALS

- A. **Wood Products:** Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
  - 1. Wood Moisture Content: 5 to 10 percent.
- B. **Composite Wood and Agrifiber Products:** Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
  - 1. Softwood Plywood: DOC PS 1; minimum 7 plies through 3/4" finish panel thickness.
  - 2. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.

### 2.4 CABINET HARDWARE AND ACCESSORIES

- A. **General:** Provide cabinet hardware and accessory materials associated with architectural cabinets.
- B. **Butt Hinges:** 2-3/4-inch, five-knuckle steel hinges made from 0.095-inch-thick metal, and as follows:
  - 1. Semiconcealed Hinges for Overlay Doors: BHMA A156.9, B01521.
- C. **Back-Mounted Pulls:** BHMA A156.9, B02011. 6" centers stainless steel wire pulls.
- D. **Adjustable Shelf Standards and Supports:** BHMA A156.9, B04071; with shelf rests, B04081.
- E. **Drawer Slides:** BHMA A156.9.
  - 1. Grade 1 and Grade 2: Side mounted and extending under bottom edge of drawer; full-extension; zinc-plated steel with polymer rollers.
  - 2. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-extension type; zinc-plated-steel ball-bearing slides.
  - 3. For drawers not more than 3 inches high and not more than 24 inches wide, provide Grade 1.
  - 4. For drawers more than 3 inches high but not more than 6 inches high and not more than 24 inches wide, provide Grade 1HD-100.



- F. Door Locks: BHMA A156.11, E07121.
- G. Drawer Locks: BHMA A156.11, E07041.
- H. Door and Drawer Silencers: BHMA A156.16, L03011.
- I. Counter Brackets: Hebgo Brackets 287.44.477 by Hafele for 24” counters.
- J. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
  - 1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
- K. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

## 2.5 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber kiln dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
- C. Adhesives: Do not use adhesives that contain urea formaldehyde.
- D. Adhesive for Bonding Plastic Laminate: Contact cement.
  - 1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

## 2.6 FABRICATION

- A. Fabricate cabinets to dimensions, profiles, and details indicated.
- B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
  - 1. Notify City seven days in advance of the dates and times woodwork fabrication will be complete.
  - 2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.



- C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

### **PART 3 - EXECUTION**

#### **3.1 PREPARATION**

- A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.
- B. Before installing cabinets, examine shop-fabricated work for completion and complete work as required.

#### **3.2 INSTALLATION**

- A. Grade: Install cabinets to comply with same grade as item to be installed.
- B. Assemble cabinets and complete fabrication at Project site to the extent that it was not completed in the shop.
- C. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
- D. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.
  - 1. Use filler matching finish of items being installed.
- F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
  - 1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
  - 2. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch penetration into wood framing, blocking, or hanging strips.

#### **3.3 ADJUSTING AND CLEANING**

- A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.



- B. Clean, lubricate, and adjust hardware.
- C. Clean cabinets on exposed and semiexposed surfaces.

**END OF SECTION 06 41 16**



## SECTION 06 64 00 - PLASTIC PANELING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Plastic sheet paneling.

#### 1.3 ACTION SUBMITTALS

- A. Samples: For plastic paneling and trim accessories, in manufacturer's standard sizes.

#### 1.4 QUALITY ASSURANCE

- A. Testing Agency: FM Approvals.

#### 1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install plastic paneling until spaces are enclosed and weathertight and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Source Limitations: Obtain plastic paneling and trim accessories from single manufacturer.

#### 2.2 PLASTIC SHEET PANELING

- A. Glass-Fiber-Reinforced Plastic Paneling: Gelcoat-finished, glass-fiber-reinforced plastic panels complying with ASTM D 5319.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product product by one of the following:
    - a. Marlite, Inc.
    - b. Crane Composites, Inc.
    - c. Glasteel.
    - d. Newcourt, Inc.



3. Surface-Burning Characteristics: As follows when tested by a qualified testing agency according to ASTM E 84. Identify products with appropriate markings of applicable testing agency.
  - a. Flame-Spread Index: 25 or less.
  - b. Smoke-Developed Index: 450 or less.
4. Nominal Thickness: Not less than 0.09 inch.
5. Surface Finish: Match existing finish.
6. Color: Match existing color.

### 2.3 ACCESSORIES

- A. Trim Accessories: Manufacturer's standard two-piece, snap-on vinyl extrusions designed to retain and cover edges of panels. Provide division bars, inside corners, outside corners, and caps as needed to conceal edges.
  1. Color: Match existing trim.
- B. Exposed Fasteners: Nylon drive rivets recommended by panel manufacturer.
- C. Concealed Mounting Splines: Continuous, H-shaped aluminum extrusions designed to fit into grooves routed in edges of factory-laminated panels and to be fastened to substrate.
- D. Sealant: Mildew-resistant, single-component, neutral-curing silicone sealant recommended by plastic paneling manufacturer and complying with requirements in Section 079200 "Joint Sealants."

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Remove wallpaper, vinyl wall covering, loose or soluble paint, and other materials that might interfere with adhesive bond.
- B. Prepare substrate by sanding high spots and filling low spots as needed to provide flat, even surface for panel installation.
- C. Clean substrates of substances that could impair adhesive bond, including oil, grease, dirt, and dust.
- D. Condition panels by unpacking and placing in installation space before installation according to manufacturer's written recommendations.
- E. Lay out paneling before installing. Locate panel joints to match existing panel pattern.
  1. Mark plumb lines on substrate at panel joint locations for accurate installation.



2. Locate trim accessories to allow clearance at panel edges according to manufacturer's written instructions.
- 3.3 INSTALLATION
- A. Install plastic paneling according to manufacturer's written instructions.
  - B. Install panels in a full spread of adhesive.
  - C. Install panels with fasteners. Layout fastener locations and mark on face of panels so that fasteners are accurately aligned.
    1. Drill oversized fastener holes in panels and center fasteners in holes.
    2. Apply sealant to fastener holes before installing fasteners.
  - D. Install factory-laminated panels using concealed mounting splines in panel joints.
  - E. Install trim accessories with mechanical fasteners. Do not fasten through panels.
  - F. Fill grooves in trim accessories with sealant before installing panels, and bed inside corner trim in a bead of sealant.
  - G. Maintain uniform space between panels and wall fixtures. Fill space with sealant.
  - H. Maintain uniform space between adjacent panels and between panels and floors, ceilings, and fixtures. Fill space with sealant.
  - I. Remove excess sealant and smears as paneling is installed. Clean with solvent recommended by sealant manufacturer and then wipe with clean dry cloths until no residue remains.

**END OF SECTION 06 64 00**



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## SECTION 07 13 26 - SELF-ADHERING SHEET WATERPROOFING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Modified bituminous sheet waterproofing.

#### 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review waterproofing requirements including surface preparation, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

#### 1.5 FIELD CONDITIONS

- A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended in writing by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.
  - 1. Do not apply waterproofing in snow, rain, fog, or mist.
- B. Maintain adequate ventilation during preparation and application of waterproofing materials.

#### 1.6 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to furnish replacement waterproofing material for waterproofing that does not comply with requirements or that fails to remain watertight within specified warranty period.
  - 1. Warranty Period: Five years from date of Substantial Completion.
- B. Installer's Special Warranty: Specified form, covering Work of this Section, for warranty period of two years.
  - 1. Warranty includes removing and reinstalling protection board and drainage panels, insulation.



**PART 2 - PRODUCTS**

2.1 MANUFACTURERS

- A. Source Limitations for Waterproofing System: Obtain waterproofing materials, protection course, molded-sheet drainage panels from single source from single manufacturer.

2.2 MODIFIED BITUMINOUS SHEET WATERPROOFING

- A. Modified Bituminous Sheet: Minimum 60-mil nominal thickness, self-adhering sheet consisting of 56 mils of rubberized asphalt laminated on one side to a 4-mil- thick, polyethylene-film reinforcement, and with release liner on adhesive side.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. American Hydrotech, Inc.; VM60.
    - b. Grace Construction Products; W.R. Grace & Co. -- Conn.; Bituthene 3000.
    - c. Henry Company; Blueskin WP 100.
    - d. Soprema, Inc.; Colphene 3000.
    - e. W.R. Meadows, Inc; SealTight Mel-Rol.
  - 2. Physical Properties:
    - a. Tensile Strength, Membrane: 250 psi minimum; ASTM D 412, Die C, modified.
    - b. Ultimate Elongation: 300 percent minimum; ASTM D 412, Die C, modified.
    - c. Low-Temperature Flexibility: Pass at minus 20 deg F; ASTM D 1970/D 1970M.
    - d. Crack Cycling: Unaffected after 100 cycles of 1/8-inch movement; ASTM C 836/C 836M.
    - e. Puncture Resistance: 40 lbf minimum; ASTM E 154/E 154M.
    - f. Water Absorption: 0.2 percent weight-gain maximum after 48-hour immersion at 70 deg F; ASTM D 570.
    - g. Water Vapor Permeance: 0.05 perm maximum; ASTM E 96/E 96M, Water Method.
    - h. Hydrostatic-Head Resistance: 200 feet minimum; ASTM D 5385.

2.3 AUXILIARY MATERIALS

- A. Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.
  - 1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.
- B. Primer: Liquid primer recommended for substrate by sheet-waterproofing material manufacturer.
- C. Protection Course: ASTM D 6506, semirigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners and as follows:
  - 1. Thickness: Nominal 1/8 inch for vertical applications; 1/4 inch elsewhere.
  - 2. Adhesive: Rubber-based solvent type recommended by waterproofing manufacturer for protection course type.



2.4 MOLDED-SHEET DRAINAGE PANELS

- A. Molded-Sheet Drainage Panel: Comply with Section 334600 "Subdrainage."

**PART 3 - EXECUTION**

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of waterproofing.
  - 1. Verify that concrete has cured and aged for minimum time period recommended in writing by waterproofing manufacturer.
  - 2. Verify that substrate is visibly dry and within the moisture limits recommended in writing by manufacturer. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
  - 3. Verify that compacted subgrade is dry, smooth, sound, and ready to receive waterproofing sheet.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.
- B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.
- C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.
- E. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.
  - 1. Install sheet strips of width according to manufacturer's written instructions and center over treated construction and contraction joints and cracks exceeding a width of 1/16 inch .
- F. Bridge and cover isolation joints, expansion joints, and discontinuous deck-to-wall and deck-to-deck joints with overlapping sheet strips of widths according to manufacturer's written instructions.
  - 1. Invert and loosely lay first sheet strip over center of joint. Firmly adhere second sheet strip to first and overlap to substrate.
- G. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D 6135.
  - 1. Install membrane strips centered over vertical inside corners. Install 3/4-inch fillets of liquid membrane on horizontal inside corners and as follows:



- a. At footing-to-wall intersections, extend liquid membrane in each direction from corner or install membrane strip centered over corner.
  - b. At plaza-deck-to-wall intersections, extend liquid membrane or sheet strips onto deck waterproofing and to finished height of sheet flashing.
- H. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to ASTM D 6135.

### 3.3 MODIFIED BITUMINOUS SHEET-WATERPROOFING APPLICATION

- A. Install modified bituminous sheets according to waterproofing manufacturer's written instructions and per recommendations in ASTM D 6135.
- B. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by sheet waterproofing in same day. Reprime areas exposed for more than 24 hours.
- C. Apply and firmly adhere sheets over area to receive waterproofing. Accurately align sheets and maintain uniform 2-1/2-inch- minimum lap widths and end laps. Overlap and seal seams, and stagger end laps to ensure watertight installation.
  1. When ambient and substrate temperatures range between 25 and 40 deg F, install self-adhering, modified bituminous sheets produced for low-temperature application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 deg F.
- D. Two-Ply Application: Install sheets to form a membrane with lap widths not less than 50 percent of sheet widths, to provide a minimum of two thicknesses of sheet membrane over areas to receive waterproofing.
- E. Horizontal Application: Apply sheets from low to high points of decks to ensure that laps shed water.
- F. Apply continuous sheets over already-installed sheet strips, bridging substrate cracks, construction, and contraction joints.
- G. Seal edges of sheet-waterproofing terminations with mastic.
- H. Install sheet-waterproofing and auxiliary materials to tie into adjacent waterproofing.
- I. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheet waterproofing extending 6 inches beyond repaired areas in all directions.
- J. Immediately install protection course with butted joints over waterproofing membrane.
  1. Molded-sheet drainage panels may be used in place of a separate protection course to vertical applications when approved by waterproofing manufacturer and installed immediately.



3.4 MOLDED-SHEET DRAINAGE-PANEL INSTALLATION

- A. Place and secure molded-sheet drainage panels, with geotextile facing away from wall or deck substrate, according to manufacturer's written instructions. Use adhesive or another method that does not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.
  - 1. For vertical applications, install protection course before installing drainage panels.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests.
- B. Manufacturer's Field Service: Engage a site representative qualified by waterproofing membrane manufacturer to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components; and to furnish reports to City.
- C. Electronic Leak-Detection Testing:
  - 1. Testing agency shall test each area for leaks using an electronic leak-detection method that locates discontinuities in the waterproofing membrane.
  - 2. Testing agency shall perform tests on abutting or overlapping smaller areas as necessary to cover entire test area.
  - 3. Testing agency shall create a conductive electronic field over the area of waterproofing to be tested and electronically determine locations of discontinuities or leaks, if any, in the waterproofing.
  - 4. Testing agency shall provide survey report indicating locations of discontinuities, if any.
- D. Waterproofing will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

3.6 PROTECTION, REPAIR, AND CLEANING

- A. Do not permit foot or vehicular traffic on unprotected membrane.
- B. Protect waterproofing from damage and wear during remainder of construction period.
- C. Protect installed insulation drainage panels from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.
- D. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.
- E. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

**END OF SECTION 07 13 26**



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## SECTION 07 21 00 - THERMAL INSULATION

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

### PART 2 - PRODUCTS

#### 2.1 GLASS FIBER BLANKET

- A. Glass-Fiber Blanket, Kraft Faced : ASTM C 665, Type II (nonreflective faced).

### PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

#### 3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.



3.3 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

**END OF SECTION 07 21 00**





## SECTION 07 25 00 - WEATHER BARRIERS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Building wrap.
  - 2. Flexible flashing.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. For building wrap, include data on air and water-vapor permeance based on testing according to referenced standards.

### PART 2 - PRODUCTS

#### 2.1 WATER-RESISTIVE BARRIER

- A. Building Wrap: ASTM E 1677, Type I air barrier; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E 84; UV stabilized; and acceptable to authorities having jurisdiction.
  - 1. Products: Subject to compliance with requirements, provide the following:
    - a. DuPont Building Innovations: E. I. du Pont de Nemours and Company; Tyvek CommercialWrap.
    - b. Raven Industries, Inc; Fortress Pro Weather Protective Barrier.
    - c. Reemay, Inc; Typar HouseWrap.
  - 2. Water-Vapor Permeance: Not less than 20 perms per ASTM E 96/E 96M, Desiccant Method (Procedure A).
  - 3. Allowable UV Exposure Time: Not less than three months.
- B. Building-Wrap Tape: Pressure-sensitive plastic tape recommended by building-wrap manufacturer for sealing joints and penetrations in building wrap.

#### 2.2 FLEXIBLE FLASHING

- A. Butyl Rubber Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 20 mil.
  - 1. Products: Subject to compliance with requirements, provide the following:
    - a. DuPont Building Innovations: E. I. du Pont de Nemours and Company; DuPont Flashing Tape.



- b. Grace Construction Products; W.R. Grace & Co. -- Conn.; Vycor Butyl Self Adhered Flashing.
  - c. Protecto Wrap Company; BT-25 XL.
  - d. Raven Industries, Inc; Fortress Flashshield.
2. Flame Propagation Test: Materials and construction shall be as tested according to NFPA 285.
- B. Nails and Staples: Product recommended in writing by flexible flashing manufacturer and complying with ASTM F 1667.

### **PART 3 - EXECUTION**

#### **3.1 WATER-RESISTIVE BARRIER INSTALLATION**

- A. Cover exposed exterior surface of sheathing with water-resistive barrier securely fastened to framing immediately after sheathing is installed.
- B. Cover sheathing with water-resistive barrier as follows:
  - 1. Cut back barrier 1/2 inch on each side of the break in supporting members at expansion- or control-joint locations.
  - 2. Apply barrier to cover vertical flashing with a minimum 4-inch overlap unless otherwise indicated.
- C. Building Wrap: Comply with manufacturer's written instructions and warranty requirements.
  - 1. Seal seams, edges, fasteners, and penetrations with tape.
  - 2. Extend into jambs of openings and seal corners with tape.

#### **3.2 FLEXIBLE FLASHING INSTALLATION**

- A. Apply flexible flashing where indicated to comply with manufacturer's written instructions.
  - 1. Prime substrates as recommended by flashing manufacturer.
  - 2. Lap seams and junctures with other materials at least 4 inches except that at flashing flanges of other construction, laps need not exceed flange width.
  - 3. Lap flashing over water-resistive barrier at bottom and sides of openings.
  - 4. Lap water-resistive barrier over flashing at heads of openings.
  - 5. Lap flashing over nailing flanges of window frame head and jambs where applicable.
  - 6. After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.

**END OF SECTION 07 25 00**



## SECTION 07 31 13 - ASPHALT SHINGLES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Asphalt shingles.
  - 2. Underlayment.
  - 3. Metal flashing and trim.

#### 1.3 DEFINITION

- A. Roofing Terminology: See ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definitions of terms related to roofing work in this Section.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified.
  - 1. Asphalt Shingles: Full size.
- C. Warranties: Sample of special warranties.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of asphalt shingle and underlayment product indicated, for tests performed by a qualified testing agency.

#### 1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Asphalt Shingles: 100 sq. ft. of each type, in unbroken bundles.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store roofing materials in a dry, well-ventilated location protected from weather, sunlight, and moisture according to manufacturer's written instructions.
- B. Store underlayment rolls on end on pallets or other raised surfaces. Do not double stack rolls.
- C. Protect unused roofing materials from weather, sunlight, and moisture when left overnight or when roofing work is not in progress.



- D. Handle, store, and place roofing materials in a manner to prevent damage to roof deck or structural supporting members.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Install self-adhering sheet underlayment within the range of ambient and substrate temperatures recommended in writing by manufacturer.

1.9 WARRANTY

- A. Special Warranty: Standard form in which manufacturer agrees to repair or replace asphalt shingles that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Manufacturing defects.
    - b. Structural failures including failure of asphalt shingles to self-seal after a reasonable time.
  - 2. Material Warranty Period: 25 years from date of Project completion, prorated, with first five years non-prorated.
  - 3. Wind-Speed Warranty Period: Asphalt shingles will resist blow-off or damage caused by wind speeds up to 60 mph years from date of Project completion.
  - 4. Algae-Discoloration Warranty Period: Asphalt shingles will not discolor five years from date of Project completion.
  - 5. Workmanship Warranty Period: 10 years from date of Project completion.
- B. Special Project Warranty: Roofing Installer's Warranty, or warranty form at end of this Section, signed by roofing Installer, covering the Work of this Section, in which roofing Installer agrees to repair or replace components of asphalt shingle roofing that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: Five years from date of Project completion.

**PART 2 - PRODUCTS**

2.1 PERFORMANCE REQUIREMENTS

- A. Exterior Fire-Test Exposure: Provide asphalt shingles and related roofing materials identical to those of assemblies tested for Class A fire resistance according to ASTM E 108 or UL 790 by Underwriters Laboratories or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.

2.2 GLASS-FIBER-REINFORCED ASPHALT SHINGLES

- A. Three-Tab-Strip Asphalt Shingles: ASTM D 3462/D 3462M, glass-fiber reinforced, mineral-granule surfaced, and self-sealing; with tabs regularly spaced.
  - 1. Basis of Design Product: Subject to compliance with requirements, provide Certainteed XT 25 Shingles or comparable product by one of the following:
    - a. IKO.
    - b. Malarkey Roofing Products Co.
    - c. Owens Corning.
    - d. TAMKO Building Products, Inc.



- e. Strip Size: 12" x 36".
  - 2. Algae Resistance: Granules resist algae discoloration.
  - 3. Impact Resistance: UL 2218, Class 4.
  - 4. Color and Blends: Match existing.
- B. Hip and Ridge Shingles: Manufacturer's standard units to match asphalt shingles.

2.3 UNDERLAYMENT MATERIALS

- A. Glass-Reinforced Felt: ASTM D 6757, glass-reinforced, asphalt-saturated organic felt.
- 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide Atlas Roofing Corporation #30 Saturated felts, or comparable product by one of the following:
    - a. Atlas Roofing Corporation.
    - b. Owens Corning.
- B. Self-Adhering Sheet Underlayment, Polyethylene Faced: ASTM D 1970/D 1970M, minimum of 40-mil- thick, slip-resisting, polyethylene-film-reinforced top surface laminated to SBS-modified asphalt adhesive, with release backing; cold applied. Provide primer for adjoining concrete or masonry surfaces to receive underlayment.
- 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide W.R. Grace Ice and Water Shield XT or comparable product by one of the following:
    - a. Atlas Roofing Corporation.
    - b. Henry Company.
    - c. Protecto Wrap Company.

2.4 ACCESSORIES

- A. Asphalt Roofing Cement: ASTM D 4586, Type II, asbestos free.
- B. Roofing Nails: ASTM F 1667; aluminum, stainless-steel, copper, or hot-dip galvanized-steel wire shingle nails, minimum 0.120-inch- diameter, sharp-pointed, with a minimum 3/8-inch-diameter flat head and of sufficient length to penetrate 3/4 inch into solid wood decking or extend at least 1/8 inch through OSB or plywood sheathing.
- 1. Shank: Smooth.
  - 2. Where nails are in contact with metal flashing, use nails made from same metal as flashing.
- C. Felt-Underlayment Nails: Aluminum, stainless-steel, or hot-dip galvanized-steel wire with low-profile capped heads or disc caps, 1-inch minimum diameter.

2.5 METAL FLASHING AND TRIM

- A. General: Comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."
- 1. Sheet Metal: Aluminum, mill finished .



- B. Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of the item.
  - 1. Step Flashings: Fabricate with a headlap of 2 inches and a minimum extension of 4 inches over the underlying asphalt shingle and up the vertical surface.
  - 2. Drip Edges: Fabricate in lengths not exceeding 10 feet with 2-inch roof-deck flange and 1-1/2-inch fascia flange with 3/8-inch drip at lower edge.
- C. Vent Pipe Flashings: ASTM B 749, Type L51121, at least 1/16 inch thick. Provide lead sleeve sized to slip over and turn down into pipe, soldered to skirt at slope of roof, and extending at least 4 inches from pipe onto roof.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
  - 1. Examine roof sheathing to verify that sheathing joints are supported by framing and blocking or metal clips and that installation is within flatness tolerances.
  - 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and completely anchored; and that provisions have been made for flashings and penetrations through asphalt shingles.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### **3.2 UNDERLAYMENT INSTALLATION**

- A. General: Comply with underlayment manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.
- B. Self-Adhering Sheet Underlayment: Install, wrinkle free, on roof deck. Comply with low-temperature installation restrictions of underlayment manufacturer if applicable. Install lapped in direction that sheds water. Lap sides not less than 3-1/2 inches. Lap ends not less than 6 inches staggered 24 inches between courses. Roll laps with roller. Cover underlayment within seven days.
  - 1. Prime concrete and masonry surfaces to receive self-adhering sheet underlayment.
  - 2. Rakes: Extend from edges of rake 24 inches beyond interior face of exterior wall.
  - 3. Sidewalls: Extend beyond sidewall 18 inches, and return vertically against sidewall not less than 4 inches.

#### **3.3 METAL FLASHING INSTALLATION**

- A. General: Install metal flashings and other sheet metal to comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."



1. Install metal flashings according to recommendations in ARMA's "Residential Asphalt Roofing Manual" and NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems."
  - B. Step Flashings: Install with a headlap of 2 inches and extend over the underlying asphalt shingle and up the vertical surface. Fasten to roof deck only.
  - C. Eave Drip Edges: Install eave drip-edge flashings below underlayment and fasten to roof sheathing.
  - D. Pipe Flashings: Form flashing around pipe penetrations and asphalt shingles. Fasten and seal to asphalt shingles as recommended by manufacturer.

### 3.4 ASPHALT-SHINGLE INSTALLATION

- A. General: Install asphalt shingles according to manufacturer's written instructions, recommendations in ARMA's "Residential Asphalt Roofing Manual," and recommendations in NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems."
- B. Install starter strip along lowest roof edge, consisting of an asphalt-shingle strip at least 7 inches wide with self-sealing strip face up at roof edge.
  1. Extend asphalt shingles 1/2 inch over fasciae at eaves and rakes.
  2. Install starter strip along rake edge.
- C. Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with half-tab offset pattern at succeeding courses, maintaining uniform exposure.
- D. Install asphalt shingles by single-strip column or racking method, maintaining uniform exposure. Install full-length first course followed by cut second course, repeating alternating pattern in succeeding courses.
- E. Fasten asphalt-shingle strips with a minimum of five roofing nails located according to manufacturer's written instructions.
  1. Where roof slope exceeds 21:12, seal asphalt shingles with asphalt roofing cement spots after fastening with additional roofing nails.
  2. Where roof slope is less than 4:12, seal asphalt shingles with asphalt roofing cement spots.
  3. When ambient temperature during installation is below 50 deg F, seal asphalt shingles with asphalt roofing cement spots.
- F. Hip and Ridge Shingles: Maintain same exposure of cap shingles as roofing shingle exposure. Lap cap shingles at ridges to shed water away from direction of prevailing winds. Fasten with roofing nails of sufficient length to penetrate sheathing.

**END OF SECTION 07 31 13**



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**SECTION 07 52 13 - ATACTIC-POLYPROPYLENE (APP) MODIFIED BITUMINOUS  
MEMBRANE ROOFING**

**PART 1 - GENERAL**

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
  - 1. Atactic-polypropylene (APP)-modified bituminous membrane roofing.

1.3 DEFINITIONS

- A. Roofing Terminology: Definitions in ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" apply to Work of this Section.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Verification: For the following products:
  - 1. Cap sheet, of color required.
  - 2. Flashing sheet, of color required.
  - 3. Base sheet.

1.5 INFORMATIONAL SUBMITTALS

- A. Sample Warranties: For manufacturer's special warranties.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
  - 1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.



- D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.7 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

**PART 2 - PRODUCTS**

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide Dibiten Poly 4.5 Slate White or comparable product by one of the following:
  - 1. CertainTeed Corporation.
  - 2. Firestone Building Products.
  - 3. GAF Materials Corporation.
  - 4. Johns Manville.
  - 5. Malarkey Roofing Company.
- C. Source Limitations: Obtain components including roof insulation, cover board, and fasteners for roofing system from manufacturer approved by membrane roofing manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roofing and base flashings shall remain watertight.
  - 1. Accelerated Weathering: Roofing system shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
  - 2. Impact Resistance: Roofing system shall resist impact damage when tested according to ASTM D 3746 or ASTM D4272.
- B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.
- C. FM Global Listing: Roofing, base flashings, and component materials shall comply with requirements in FM Global 4450 or FM Global 4470 as part of a roofing system, and shall be listed in FM Global' "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.
  - 1. Fire/Windstorm Classification: Class 1A-90.
  - 2. Hail-Resistance Rating: MH.
- D. Energy Star Listing: Roofing system shall be listed on the DOE's ENERGY STAR "Roof Products Qualified Product List" for low-slope roof products.



- E. Energy Performance: Roofing system shall have an initial solar reflectance of not less than 0.70 and an emissivity of not less than 0.75 when tested according to CRRC-1.
- F. Exterior Fire-Test Exposure: ASTM E 108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- G. Fire-Resistance Ratings: Comply with fire-resistance-rated assembly design indicated.

### 2.3 ROOFING SHEET MATERIALS

- A. Roofing Membrane Sheet: ASTM D 6223/D 6223M, Grade S, Type I or II, APP-modified asphalt sheet (reinforced with a combination of polyester fabric and glass fibers); smooth surfaced; suitable for application method specified.
- B. Granule-Surfaced Roofing Cap Sheet: ASTM D 6222/D 6222M, Grade G, Type I or II, APP-modified asphalt sheet (reinforced with polyester fabric); granule surfaced; suitable for application method specified, and as follows:
  - 1. Granule Material: Slate.
  - 2. Granule Color: White.

### 2.4 BASE FLASHING SHEET MATERIALS

- A. Backer Sheet: smooth surfaced; suitable for application method specified.
- B. Granule-Surfaced Flashing Sheet: ASTM D 6223/D 6223M, Grade G, Type I or II, APP-modified asphalt sheet (reinforced with a combination of polyester fabric and glass fibers); granule surfaced; suitable for application method specified, and as follows:
  - 1. Granule Color: White.

### 2.5 AUXILIARY ROOFING MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing.
  - 1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
- B. Cold-Applied Adhesive: Roofing system manufacturer's standard asphalt-based, one- or two-part, asbestos-free, cold-applied adhesive specially formulated for compatibility and use with roofing membrane and base flashings.
- C. Mastic Sealant: Polyisobutylene, plain or modified bitumen; nonhardening, nonmigrating, nonskinning, and nondrying.
- D. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening roofing components to substrate; tested by manufacturer for required pullout strength, and acceptable to roofing system manufacturer.
- E. Roofing Granules: Slate roofing granules, No. 11 screen size with 100 percent passing No. 8 sieve and 98 percent of mass retained on No. 40 sieve, color to match roofing.



- F. Miscellaneous Accessories: Provide those recommended by roofing system manufacturer.

## 2.6 SUBSTRATE BOARDS

- A. Substrate Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, Type X, 1/4 inch thick.
  - 1. Products: Subject to compliance with requirements, provide the following:
    - a. CertainTeed Corporation; ProRoc.
    - b. Georgia-Pacific Corporation; DensGlass Sheathing.
    - c. National Gypsum Company; Gold Bond eXP Extended Exposure Sheathing.
    - d. USG Corporation; Securock Glass Mat Roof Board.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening substrate board to roof deck.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work:
  - 1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
  - 2. Verify that wood cants, blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
  - 3. Verify that deck is securely fastened with no projecting fasteners and with no adjacent units in excess of 1/16 inch out of plane relative to adjoining deck.
  - 4. Verify that minimum concrete drying period recommended by roofing system manufacturer has passed.
  - 5. Verify that concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
    - a. Test for moisture by pouring 1 pint of hot roofing asphalt on deck at start of each day's work and at start of each roof area or plane. Do not proceed with Work of this Section if test sample foams or can be easily and cleanly stripped after cooling.
  - 6. Verify that concrete-curing compounds that impair adhesion of roofing components to roof deck have been removed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.



### 3.3 INSTALLATION, GENERAL

- A. Comply with roofing system manufacturer's written instructions.
- B. Substrate-Joint Penetrations: Prevent roofing asphalt and adhesives from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.

### 3.4 SUBSTRATE BOARD INSTALLATION

- A. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.
  - 1. Fasten substrate board to top flanges of steel deck according to recommendations in FM Global's "RoofNav" and FM Global Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification.
  - 2. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to roofing system manufacturers' written instructions.

### 3.5 ROOFING INSTALLATION, GENERAL

- A. Install roofing system according to roofing system manufacturer's written instructions and applicable recommendations in ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing."
  - 1. Install roofing system MBA 3-N-L-M, according to roof assembly identification matrix and roof assembly layout illustrations in NRCA's "The NRCA Roofing and Waterproofing Manual" and to Section requirements.
- B. Install roofing system according to roofing system manufacturer's written instructions and applicable recommendations in ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing" and as follows:
  - 1. Deck Type: N (nailable).
  - 2. Base Sheet: One.
- C. Start installation of roofing in presence of manufacturer's technical personnel.
- D. Coordinate installation of roofing system so insulation and other components of the roofing system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.
  - 1. Provide tie-offs at end of day's work to cover exposed roofing sheets and insulation with a course of coated felt set in roofing cement or hot roofing asphalt, with joints and edges sealed.
  - 2. Complete terminations and base flashings, and provide temporary seals to prevent water from entering completed sections of roofing system.
  - 3. Remove and discard temporary seals before beginning work on adjoining roofing.

### 3.6 BASE-SHEET INSTALLATION

- A. Install lapped base-sheet course, extending sheet over and terminating beyond cants. Attach base sheet as follows:
  - 1. Adhere to substrate in a uniform coating of cold-applied adhesive.



### 3.7 APP-MODIFIED BITUMINOUS MEMBRANE INSTALLATION

- A. Install modified bituminous roofing sheet and cap sheet according to roofing manufacturer's written instructions, starting at low point of roofing system. Extend roofing sheets over and terminate beyond cants, installing as follows:
  - 1. Torch apply to substrate.
  - 2. Unroll roofing sheets and allow them to relax for minimum time period required by manufacturer.
- B. Laps: Accurately align roofing sheets, without stretching, and maintain uniform side and end laps. Stagger end laps. Completely bond and seal laps, leaving no voids.
  - 1. Repair tears and voids in laps and lapped seams not completely sealed.
  - 2. Apply roofing granules to cover exuded bead at laps while bead is hot.
- C. Install roofing sheets so side and end laps shed water.

### 3.8 FLASHING AND STRIPPING INSTALLATION

- A. Install base flashing over cant strips and other sloping and vertical surfaces, at roof edges, and at penetrations through roof; secure to substrates according to roofing system manufacturer's written instructions and as follows:
  - 1. Prime substrates with asphalt primer if required by roofing system manufacturer.
  - 2. Flashing-Sheet Application: Torch apply flashing sheet to substrate.
- B. Extend base flashing up walls or parapets a minimum of 8 inches above roofing membrane and 4 inches onto field of roofing membrane.
- C. Mechanically fasten top of base flashing securely at terminations and perimeter of roofing.
- D. Install roofing cap-sheet stripping where metal flanges and edgings are set on roofing according to roofing system manufacturer's written instructions.
- E. Roof Drains: Set 30-by-30-inch metal flashing in bed of asphaltic adhesive on completed roofing membrane. Cover metal flashing with roofing cap-sheet stripping, and extend a minimum of 6 inches beyond edge of metal flashing onto field of roofing membrane. Clamp roofing membrane, metal flashing, and stripping into roof-drain clamping ring.
  - 1. Install stripping according to roofing system manufacturer's written instructions.

### 3.9 WALKWAY INSTALLATION

- A. Walkway Pads: Install walkway pads, using units of size indicated or, if not indicated, of manufacturer's standard size, according to walkway pad manufacturer's written instructions.

**END OF SECTION 07 52 13**



## SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Manufactured reglets with counterflashing.
  - 2. Formed low-slope roof sheet metal fabrications.

#### 1.3 COORDINATION

- A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.
- B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

#### 1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  - 2. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.
  - 3. Review requirements for insurance and certificates if applicable.
  - 4. Review sheet metal flashing observation and repair procedures after flashing installation.

#### 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.
- B. Shop Drawings: For sheet metal flashing and trim.
  - 1. Include plans, elevations, sections, and attachment details.
  - 2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.
  - 3. Include identification of material, thickness, weight, and finish for each item and location in Project.
  - 4. Include details for forming, including profiles, shapes, seams, and dimensions.
  - 5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
  - 6. Include details of termination points and assemblies.





7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
8. Include details of roof-penetration flashing.
9. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
10. Include details of special conditions.
11. Include details of connections to adjoining work.
12. Detail formed flashing and trim at scale of not less than 3 inches per 12 inches .

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
- B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

#### 1.7 WARRANTY

- A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
  1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
    - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
    - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
  2. Finish Warranty Period: 20 years from date of Substantial Completion.

### **PART 2 - PRODUCTS**

#### 2.1 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Sheet Metal Standard for Flashing and Trim: Comply with SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. FM Approvals Listing: Manufacture and install copings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-120. Identify materials with name of fabricator and design approved by FM Approvals.
- D. SPRI Wind Design Standard: Manufacture and install copings tested according to SPRI ES-1 and capable of resisting the following design pressure:





- E. Design Pressure: As indicated on Drawings.
- F. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 20 percent.
- G. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

## 2.2 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

## 2.3 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Sheet: Minimum 30 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer according to written recommendations of underlayment manufacturer.
  - 1. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F or higher.
  - 2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F or lower.
- B. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. minimum.

## 2.4 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
  - 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
  - 2. Fasteners for Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.
- C. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
- D. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.



- E. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

## 2.5 MANUFACTURED SHEET METAL FLASHING AND TRIM

- A. Reglets: Units of type, material, and profile required, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with interlocking counterflashing on exterior face, of same metal as reglet.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide Fry Reglet; Springlock Flashing System or comparable product by one of the following:
    - a. OMG EdgeSystems (formerly Hickman Engineered Systems).
    - b. Keystone Flashing Company, Inc.
    - c. National Sheet Metal Systems, Inc.
  - 3. Material: Aluminum, 0.024 inch thick.
  - 4. Stucco Type: Provide with upturned fastening flange and extension leg of length to match thickness of applied finish materials.
  - 5. Finish: With manufacturer's standard color coating.

## 2.6 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
  - 1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
  - 2. Obtain field measurements for accurate fit before shop fabrication.
  - 3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
  - 4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.
- B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- C. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."
- D. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
  - 1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
  - 2. Use lapped expansion joints only where indicated on Drawings.
- E. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.



- F. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- G. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard and by FM Global Property Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.
- H. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
- I. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.
- J. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints where necessary for strength.
- K. Do not use graphite pencils to mark metal surfaces.

## 2.7 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Roof Edge Flashing (Gravel Stop): Fabricate in minimum 96-inch- long, but not exceeding 12-foot- long sections. Furnish with 6-inch- wide, joint cover plates. Shop fabricate interior and exterior corners.
  - 1. Joint Style: lapped minimum 4".
  - 2. Fabricate with scuppers spaced 10 feet apart, to dimensions required with 4-inch- wide flanges and base extending 4 inches beyond cant or tapered strip into field of roof. Fasten gravel guard angles to base of scupper.
  - 3. Fabricate from the Following Materials:
    - a. Aluminum: 0.050 inch thick.
- B. Copings: Fabricate in minimum 96-inch- long, but not exceeding 12-foot- long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior leg. Miter corners, fasten and seal watertight. Shop fabricate interior and exterior corners.
  - 1. Coping Profile: Fig 3-4A according to SMACNA's "Architectural Sheet Metal Manual." Match existing coping profile at the respective buildings.
  - 2. Joint Style: Butted with expansion space and 6-inch- wide, concealed backup plate.
  - 3. Fabricate from the Following Materials:
    - a. Aluminum: 0.050 inch thick.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.
  - 1. Verify compliance with requirements for installation tolerances of substrates.



2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
  3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 UNDERLAYMENT INSTALLATION

- A. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps and edges with roller. Cover underlayment within 14 days.
- B. Apply slip sheet, wrinkle free, directly on substrate before installing sheet metal flashing and trim.

### 3.3 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
  2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
  3. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
  4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
  5. Torch cutting of sheet metal flashing and trim is not permitted.
  6. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
1. Coat concealed side of uncoated-aluminum sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
  2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.



1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
  2. Use lapped expansion joints only where indicated on Drawings.
- D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- F. Seal joints as required for watertight construction.
1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
  2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."
- G. Rivets: Rivet joints in uncoated aluminum where necessary for strength.

#### 3.4 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
- B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch centers.
- C. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for FM Approvals' listing for required windstorm classification.
- D. Copings: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated.
1. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at 24-inch centers.
  2. Anchor interior leg of coping with washers and screw fasteners through slotted holes at 24-inch centers.
- E. Copings: Anchor to resist uplift and outward forces according to recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for specified FM Approvals' listing for required windstorm classification.



- F. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.

### 3.5 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

### 3.6 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Clean off excess sealants.
- D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.
- E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

**END OF SECTION 07 62 00**



## SECTION 07 71 00 - ROOF SPECIALTIES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Roof-edge drainage systems.
- B. Preinstallation Conference: Conduct conference at Fire Station in Work.
  - 1. Meet with City, Architect, City's insurer if applicable, roofing-system testing and inspecting agency representative, roofing Installer, roofing-system manufacturer's representative, Installer, structural-support Installer, and installers whose work interfaces with or affects roof specialties, including installers of roofing materials and accessories.
  - 2. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
  - 3. Review special roof details, roof drainage, and condition of other construction that will affect roof specialties.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For roof specialties.
  - 1. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work.
  - 2. Include details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
  - 3. Indicate profile and pattern of seams and layout of fasteners, cleats, clips, and other attachments.
  - 4. Detail termination points and assemblies, including fixed points.
  - 5. Include details of special conditions.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For manufacturer's special warranty.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For roofing specialties to include in maintenance manuals.





**1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Do not store roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.
- B. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to extent necessary for the period of roof-specialty installation.

**1.7 FIELD CONDITIONS**

- A. Field Measurements: Verify profiles and tolerances of roof-specialty substrates by field measurements before fabrication, and indicate measurements on Shop Drawings.
- B. Coordination: Coordinate roof specialties with flashing, trim, and construction of parapets, roof deck, roof and wall panels, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

**1.8 WARRANTY**

- A. Warranted materials shall be free of defects in material and workmanship for five years after shipment. If, after inspection, the manufacturer agrees that materials are defective, the manufacturer shall at their option repair or replace them.
- B. Special Warranty on Painted Finishes: Manufacturer agrees to repair finish or replace roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
    - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
    - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
  - 2. Finish Warranty Period: 10 years from date of Substantial Completion.

**PART 2 - PRODUCTS**

**2.1 ROOF-EDGE DRAINAGE SYSTEMS**

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - 1. ATAS International, Inc.
  - 2. Hickman Company, W. P.
  - 3. Metal-Era, Inc.
  - 4. Perimeter Systems; a division of SAF.
- C. Gutters: Manufactured in uniform section lengths not exceeding 12 feet, with matching corner units, ends, outlet tubes, and other accessories. Elevate back edge at least 1 inch above front edge. Furnish flat-stock gutter straps, gutter brackets, expansion joints, and expansion-joint covers fabricated from same metal as gutters.







1. Aluminum Sheet: 0.050 inch thick.
  2. Gutter Profile: Style A according to SMACNA's "Architectural Sheet Metal Manual."
  3. Corners: Factory mitered and soldered.
  4. Gutter Supports: Gutter brackets with finish matching the gutters.
  5. Gutter Accessories: Continuous snap-in plastic leaf guard.
- D. Downspouts: Plain round complete with mitered elbows, manufactured from the following exposed metal. Furnish with metal hangers, from same material as downspouts, and anchors.
1. Formed Aluminum: 0.040 inch thick.
- E.
- 2.2 FINISHES
- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
  - B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

## **PART 3 - EXECUTION**

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
- B. Examine walls, roof edges, and parapets for suitable conditions for roof specialties.
- C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage where applicable, and securely anchored.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION, GENERAL

- A. General: Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, underlayments, sealants, and other miscellaneous items as required to complete roof-specialty systems.
  1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
  2. Provide uniform, neat seams with minimum exposure of solder and sealant.
  3. Install roof specialties to fit substrates and to result in weathertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
  4. Torch cutting of roof specialties is not permitted.
  5. Do not use graphite pencils to mark metal surfaces.



- B. **Metal Protection:** Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
  - 1. Coat concealed side of uncoated aluminum roof specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
  - 2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.
- C. **Expansion Provisions:** Allow for thermal expansion of exposed roof specialties.
  - 1. Space movement joints at a maximum of 12 feet with no joints within 18 inches of corners or intersections unless otherwise indicated on Drawings.
  - 2. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.
- D. **Fastener Sizes:** Use fasteners of sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
- E. Seal concealed joints with butyl sealant as required by roofing-specialty manufacturer.
- F. Seal joints as required for weathertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F.

### 3.3 ROOF-EDGE DRAINAGE-SYSTEM INSTALLATION

- A. **General:** Install components to produce a complete roof-edge drainage system according to manufacturer's written instructions. Coordinate installation of roof perimeter flashing with installation of roof-edge drainage system.
- B. **Gutters:** Join and seal gutter lengths. Allow for thermal expansion. Attach gutters to firmly anchored gutter supports spaced not more than 24 inches apart. Attach ends with rivets and seal with sealant to make watertight. Slope to downspouts.
  - 1. Install gutter with expansion joints at locations indicated but not exceeding 50 feet apart. Install expansion-joint caps.
  - 2. Install continuous leaf guards on gutters with noncorrosive fasteners, removable for cleaning gutters.
- C. **Downspouts:** Join sections with manufacturer's standard telescoping joints. Provide hangers with fasteners designed to hold downspouts securely to walls and 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c.
  - 1. Provide elbows at base of downspouts at grade to direct water away from building.
- D. Connect downspouts to underground drainage system indicated. Install cleats, anchor plates, and other anchoring and attachment accessories and devices with concealed fasteners.

### 3.4 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder and sealants.



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- C. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.
- D. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

**END OF SECTION 07 71 00**



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## SECTION 07 84 13 - PENETRATION FIRESTOPPING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Penetrations in fire-resistance-rated walls.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."
- B. Installer Qualifications: A firm experienced in installing penetration firestopping similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its penetration firestopping products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.
- C. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:
  - 1. Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
  - 2. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems complying with the following requirements:
    - a. Penetration firestopping products bear classification marking of qualified testing and inspecting agency.
    - b. Classification markings on penetration firestopping correspond to designations listed by the following:
      - 1) UL in its "Fire Resistance Directory."



1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install penetration firestopping when ambient or substrate temperatures are outside limits permitted by penetration firestopping manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.
- B. Install and cure penetration firestopping per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.7 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping is installed according to specified requirements.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping.

**PART 2 - PRODUCTS**

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Grace Construction Products.
  - 2. Hilti, Inc.
  - 3. Specified Technologies Inc.
  - 4. 3M Fire Protection Products.
  - 5. Tremco, Inc.; Tremco Fire Protection Systems Group.

2.2 PENETRATION FIRESTOPPING

- A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
- B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
  - 1. Fire-resistance-rated walls include fire-barrier and smoke barrier walls.
  - 2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Low-Emitting Materials: Penetration firestopping sealants and sealant primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."



- D. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.
  - 1. Temporary forming materials.
  - 2. Steel sleeves.

### 2.3 MIXING

- A. For those products requiring mixing before application, comply with penetration firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Cleaning: Clean out openings immediately before installing penetration firestopping to comply with manufacturer's written instructions and with the following requirements:
  - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping.
  - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. Remove loose particles remaining from cleaning operation.
  - 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping's seal with substrates.



### 3.3 INSTALLATION

- A. General: Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
  - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.
- C. Install fill materials for firestopping by proven techniques to produce the following results:
  - 1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
  - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
  - 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

### 3.4 IDENTIFICATION

- A. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
  - 1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
  - 2. Contractor's name, address, and phone number.
  - 3. Designation of applicable testing and inspecting agency.
  - 4. Date of installation.
  - 5. Manufacturer's name.
  - 6. Installer's name.

### 3.5 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping is without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping and install new materials to produce systems complying with specified requirements.





3.6 PENETRATION FIRESTOPPING SCHEDULE

- A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHEZ.
- B. Firestopping for Metallic Pipes, Conduit, or Tubing:
  - 1. UL-Classified Systems: W-L-1028.
  - 2. Type of Fill Materials: As required to achieve rating.
- C. Firestopping for Nonmetallic Pipe, Conduit, or Tubing:
  - 1. UL-Classified Systems: W-L-2242.
  - 2. Type of Fill Materials: As required to achieve rating.
- D. Firestopping for Insulated Pipes:
  - 1. UL-Classified Systems: W-L-8011.
  - 2. Type of Fill Materials: As required to achieve rating.
- E. Firestopping for Flexible Metallic Electrical Penetrants:
  - 1. UL-Classified Systems: W-L-1224.
  - 2. Type of Fill Materials: As required to achieve rating.

**END OF SECTION 07 84 13**



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## SECTION 07 92 00 - JOINT SEALANTS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  1. Silicone joint sealants.
  2. Urethane joint sealants.
  3. Mildew-resistant joint sealants.
  4. Butyl joint sealants.
  5. Latex joint sealants.

#### 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product.
- B. Joint-Sealant Schedule: Include the following information:
  1. Joint-sealant application, joint location, and designation.
  2. Joint-sealant manufacturer and product name.
  3. Joint-sealant formulation.
  4. Joint-sealant color.

#### 1.5 PRECONSTRUCTION TESTING

- A. Preconstruction Laboratory Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
  1. Adhesion Testing: Use ASTM C 794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
  2. Compatibility Testing: Use ASTM C 1087 to determine sealant compatibility when in contact with glazing and gasket materials.
  3. Stain Testing: Use ASTM C 1248 to determine stain potential of sealant when in contact with masonry substrates.
  4. Submit manufacturer's recommended number of pieces of each type of material, including joint substrates, joint-sealant backings, and miscellaneous materials.
  5. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
  6. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures, including use of specially formulated primers.



7. Testing will not be required if joint-sealant manufacturers submit data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, staining of, and compatibility with joint substrates and other materials matching those submitted.
- B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:
1. Locate test joints where indicated on Project or, if not indicated, as directed by City.
  2. Conduct field tests for each kind of sealant and joint substrate.
  3. Notify City seven days in advance of dates and times when test joints will be erected.
  4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.
    - a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
      - 1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
  5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
  6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

#### 1.6 FIELD CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer.
  2. When joint substrates are wet.
  3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
  4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

#### 1.7 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
1. Warranty Period: Five years from date of Substantial Completion.
- C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:



1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

## PART 2 - PRODUCTS

### 2.1 SILICONE JOINT SEALANTS

- A. Silicone, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
  1. Products: Subject to compliance with requirements, provide the following:
    - a. Dow Corning Corporation; 758.
    - b. GE Construction Sealants; Momentive Performance Materials Inc; SCS2350.
    - c. Polymeric Systems, Inc..

### 2.2 URETHANE JOINT SEALANTS

- A. Urethane, S, NS, 25, NT: Single-component, nonsag, nontraffic-use, plus 25 percent and minus 25 percent movement capability, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
  1. Products: Subject to compliance with requirements, provide the following:
    - a. BASF Construction Chemicals - Building Systems; Sonalastic TX1.
    - b. Pecora Corporation; Dynatrol I-XL.
    - c. Polymeric Systems, Inc.; Flexiprene 1000.
    - d. Sika Corporation U.S.; Sikaflex Textured Sealant.
    - e. Tremco Incorporated; Dymonic.

### 2.3 MILDEW-RESISTANT JOINT SEALANTS

- A. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
  1. Products: Subject to compliance with requirements, provide the following:
    - a. Dow Corning Corporation; 786-M White.
    - b. GE Construction Sealants; Momentive Performance Materials Inc.; SCS1700 Sanitary.
    - c. Tremco Incorporated; Tremsil 200.

### 2.4 BUTYL JOINT SEALANTS

- A. Butyl-Rubber-Based Joint Sealants: ASTM C 1311.
  1. Products: Subject to compliance with requirements, provide the following:
    - a. Bostik, Inc.; Chem-Calk 300.
    - b. Pecora Corporation; BC-158.



2.5 LATEX JOINT SEALANTS

- A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
  - 1. Products: Subject to compliance with requirements, provide the following:
    - a. BASF Construction Chemicals - Building Systems; Sonolac.
    - b. Pecora Corporation; AC-20.
    - c. Sherwin-Williams Company (The); .
    - d. Tremco Incorporated; Tremflex 834.

2.6 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

**PART 3 - EXECUTION**

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
  - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
  - 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
    - a. Concrete.
    - b. Masonry.
    - c. Unglazed surfaces of ceramic tile.
  - 3. Remove laitance and form-release agents from concrete.



4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
  - a. Metal.
  - b. Glass.
  - c. Porcelain enamel.
  - d. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

### 3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
  1. Do not leave gaps between ends of sealant backings.
  2. Do not stretch, twist, puncture, or tear sealant backings.
  3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
  1. Place sealants so they directly contact and fully wet joint substrates.
  2. Completely fill recesses in each joint configuration.
  3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
  1. Remove excess sealant from surfaces adjacent to joints.
  2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.



3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.
4. Provide recessed joint configuration of recess depth and at locations indicated on Drawings according to Figure 8C in ASTM C 1193.
  - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

### 3.4 FIELD QUALITY CONTROL

- A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
  1. Extent of Testing: Test completed and cured sealant joints as follows:
    - a. Perform 10 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.
    - b. Perform one test for each 1000 feet of joint length thereafter or one test per each floor per elevation.
  2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
    - a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
  3. Inspect tested joints and report on the following:
    - a. Whether sealants filled joint cavities and are free of voids.
    - b. Whether sealant dimensions and configurations comply with specified requirements.
    - c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.
  4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant material, sealant configuration, and sealant dimensions.
  5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.
- B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

### 3.5 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.





3.6 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.7 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces JS-1.
  - 1. Joint Locations:
    - a. Isolation and contraction joints in cast-in-place concrete slabs.
    - b. Other joints as indicated on Drawings.
  - 2. Joint Sealant: Urethane, M, P, 50, T, NT.
  - 3. Joint-Sealant Color: As selected by City from manufacturer's full range of colors.
- B. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces JS-2.
  - 1. Joint Locations:
    - a. Joints between plant-precast architectural concrete units.
    - b. Control and expansion joints in unit masonry.
    - c. Joints in dimension stone cladding.
    - d. Joints in glass unit masonry assemblies.
    - e. Joints in exterior insulation and finish systems.
    - f. Joints between metal panels.
    - g. Joints between different materials listed above.
    - h. Perimeter joints between materials listed above and frames of doors windows and louvers.
    - i. Other joints as indicated on Drawings.
  - 2. Joint Sealant: Silicone, nonstaining, S, NS, 50, NT. Joint-Sealant Color: As selected by City from manufacturer's full range of colors.
  - 3. Joint-Sealant Color: As selected by City from manufacturer's full range of colors.
- C. Joint-Sealant Application: Interior joints in horizontal traffic surfaces JS-3.
  - 1. Joint Locations:
    - a. Isolation joints in cast-in-place concrete slabs.
    - b. Other joints as indicated on Drawings.
  - 2. Joint Sealant: Urethane, S, P, 25, T, NT.
  - 3. Joint-Sealant Color: As selected by City from manufacturer's full range of colors.
- D. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces JS-4.
  - 1. Joint Locations:
    - a. Control and expansion joints on exposed interior surfaces of exterior walls.
    - b. Tile control and expansion joints.
    - c. Vertical joints on exposed surfaces of unit masonry walls.
    - d. Other joints as indicated on Drawings.
  - 2. Joint Sealant: Urethane, S, NS, 25, NT.
  - 3. Joint-Sealant Color: As selected by City from manufacturer's full range of colors.



- E. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement JS-5.
  - 1. Control joints on exposed interior surfaces of exterior walls.
  - 2. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
  - 3. Other joints as indicated on Drawings.
  - 4. Joint-Sealant: acrylic latex.
  - 5. Joint-Sealant Color: As selected by City from manufacturer's full range of colors.
  
- F. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces JS-6.
  - 1. Joint Locations:
    - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
    - b. Tile control and expansion joints where indicated.
    - c. Other joints as indicated on Drawings.
  - 2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT.
  - 3. Joint-Sealant Color: As selected by City from manufacturer's full range of colors.
  
- G. Joint-Sealant Application: Concealed mastics JS-7.
  - 1. Joint Locations:
    - a. Aluminum thresholds.
    - b. Sill plates.
    - c. Other joints as indicated on Drawings.
  - 2. Joint Sealant: Butyl-rubber based.
  - 3. Joint-Sealant Color: Black.

**END OF SECTION 07 92 00**



## SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section includes hollow-metal work.

#### 1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

#### 1.4 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site no more than two weeks prior to installation.

#### 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, and finishes.
- B. Shop Drawings: Include the following:
  - 1. Elevations of each door type.
  - 2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
  - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
  - 4. Locations of reinforcement and preparations for hardware.
  - 5. Details of each different wall opening condition.
  - 6. Details of anchorages, joints, field splices, and connections.
  - 7. Details of accessories.
  - 8. Details of moldings, removable stops, and glazing.
  - 9. Details of conduit and preparations for power, signal, and control systems.
- C. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

#### 1.6 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.



1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
  - 1. Provide additional protection to prevent damage to factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch- high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

**PART 2 - PRODUCTS**

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 1. Amweld International, LLC.
  - 2. Ceco Door; ASSA ABLOY.
  - 3. Curries Company; ASSA ABLOY.
  - 4. Fleming Door Products Ltd.; Assa Abloy Group Company.
  - 5. Shanahans Manufacturing Ltd.
  - 6. Steelcraft; an Ingersoll-Rand company.
- B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.2 REGULATORY REQUIREMENTS

- A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

2.3 INTERIOR DOORS AND FRAMES

- A. Construct interior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Commercial Doors and Frames: NAAMM-HMMA 861. At locations indicated in the Door and Frame Schedule.
  - 1. Physical Performance: Level A according to SDI A250.4.
  - 2. Frames:
    - a. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch.
    - b. Frames: Fabricated from same material as adjacent door frame.
    - c. Construction: Full profile welded.
  - 3. Exposed Finish: Prime.



2.4 EXTERIOR HOLLOW-METAL DOORS AND FRAMES

- A. Construct exterior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Commercial Laminated Doors and Frames: NAAMM-HMMA 867. At locations indicated in the Door and Frame Schedule.
  - 1. Physical Performance: Level A according to SDI A250.4.
  - 2. Doors:
    - a. Type: As indicated in the Door and Frame Schedule.
    - b. Thickness: 1-3/4 inches
    - c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum G90 A90 coating.
    - d. Core: Polyisocyanurate.
  - 3. Frames:
    - a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum G90 A90 coating.
    - b. Construction: Full profile welded.
  - 4. Exposed Finish: Prime.

2.5 FRAME ANCHORS

- A. Jamb Anchors:
  - 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
  - 2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
- B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch, and as follows:
  - 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

2.6 MATERIALS

- A. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- B. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.
  - 1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- C. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- D. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application as indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.



2.7 FABRICATION

- A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
  
- B. Hollow-Metal Doors:
  - 1. Steel-Stiffened Door Cores: Provide minimum thickness 0.026 inch, steel vertical stiffeners of same material as face sheets extending full-door height, with vertical webs spaced not more than 6 inches apart. Spot weld to face sheets no more than 5 inches o.c. Fill spaces between stiffeners with glass- or mineral-fiber insulation.
  - 2. Fire Door Cores: As required to provide fire-protection ratings indicated.
  - 3. Vertical Edges for Single-Acting Doors: Bevel edges 1/8 inch in 2 inches.
  - 4. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets.
  - 5. Bottom Edge Closures: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets.
  - 6. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
  - 7. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.
  
- C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
  - 1. Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
  - 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
  - 3. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
  - 4. Jamb Anchors: Provide number and spacing of anchors as follows:
    - a. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
      - 1) Three anchors per jamb up to 60 inches high.
      - 2) Four anchors per jamb from 60 to 90 inches high.
      - 3) Five anchors per jamb from 90 to 96 inches high.
      - 4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
  - 5. Head Anchors: Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.
  - 6. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
    - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.



- D. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.
- E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
  - 1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
  - 2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.

## 2.8 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
  - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

## 2.9 ACCESSORIES

- A. Louvers: Provide louvers for interior doors, where indicated, which comply with SDI 111C, with blades or baffles formed of 0.020-inch- thick, cold-rolled steel sheet set into 0.032-inch-thick steel frame.
  - 1. Sightproof Louver: Stationary louvers constructed with inverted-V or inverted-Y blades.
  - 2. Lightproof Louver: Stationary louvers constructed with baffles to prevent light from passing from one side to the other.
  - 3. Fire-Rated Automatic Louvers: Louvers constructed with movable blades closed by actuating fusible link, and listed and labeled for use in fire-rated door assemblies of type and fire-resistance rating indicated by same qualified testing and inspecting agency that established fire-resistance rating of door assembly.

## **PART 3 - EXECUTION**

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.





### 3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

### 3.3 INSTALLATION

- A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.
- B. Hollow-Metal Frames: Install hollow-metal frames for doors, transoms, sidelites, borrowed lites, and other openings, of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.
  - 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
    - a. At fire-rated openings, install frames according to NFPA 80.
    - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
    - c. Install frames with removable stops located on secure side of opening.
    - d. Install door silencers in frames before grouting.
    - e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    - f. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
    - g. Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents.
  - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
    - a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
  - 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
  - 4. In-Place Metal or Wood-Stud Partitions: Secure slip-on drywall frames in place according to manufacturer's written instructions.
  - 5. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
    - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
    - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.





- C. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.
  - 1. Non-Fire-Rated Steel Doors:
    - a. Between Door and Frame Jambs and Head: 1/8 inch plus or minus 1/32 inch.
    - b. Between Edges of Pairs of Doors: 1/8 inch to 1/4 inch plus or minus 1/32 inch.
    - c. At Bottom of Door: 3/4 inch plus or minus 1/32 inch.
    - d. Between Door Face and Stop: 1/16 inch to 1/8 inch plus or minus 1/32 inch.
  - 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

#### 3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow-metal work immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.
- E. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

**END OF SECTION 08 11 13**



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## SECTION 08 14 16 - FLUSH WOOD DOORS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Solid-core doors with wood-veneer faces.
  - 2. Factory finishing flush wood doors.
  - 3. Factory fitting flush wood doors to frames and factory machining for hardware.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of door. Include details of core and edge construction and trim for openings. Include factory-finishing specifications.
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:
  - 1. Dimensions and locations of blocking.
  - 2. Dimensions and locations of mortises and holes for hardware.
  - 3. Dimensions and locations of cutouts.
  - 4. Undercuts.
  - 5. Requirements for veneer matching.
  - 6. Doors to be factory finished and finish requirements.
  - 7. Fire-protection ratings for fire-rated doors.
- C. Samples for Initial Selection: For factory-finished doors.
- D. Samples for Verification:
  - 1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches (200 by 250 mm), for each material and finish. For each wood species and transparent finish, provide set of three Samples showing typical range of color and grain to be expected in finished Work.
  - 2. Corner sections of doors, approximately 8 by 10 inches (200 by 250 mm), with door faces and edges representing actual materials to be used.
    - a. Finish veneer-faced door Samples with same materials proposed for factory-finished doors.
  - 3. Frames for light openings, 6 inches (150 mm) long, for each material, type, and finish required.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.



- B. Package doors individually in plastic bags or cardboard cartons.
- C. Mark each door on bottom rail with opening number used on Shop Drawings.

#### 1.5 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during remainder of construction period.
- B. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during remainder of construction period.

#### 1.6 WARRANTY

- A. A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
    - b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
  - 2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
  - 3. Warranty Period for Solid-Core Interior Doors: Life of installation.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 1. Algoma Hardwoods, Inc.
  - 2. Eggers Industries.
  - 3. Graham Wood Doors; an Assa Abloy Group company.
  - 4. Marshfield Door Systems, Inc.
  - 5. Vancouver Door Company.
  - 6. VT Industries, Inc.
- B. Source Limitations: Obtain flush wood doors from single manufacturer.

### 2.2 FLUSH WOOD DOORS, GENERAL

- A. Quality Standard: In addition to requirements specified, comply with AWI's, AWMAC's, and WI's "Architectural Woodwork Standards WDMA I.S.1-A, "Architectural Wood Flush Doors."
  - 1. Provide AWI Quality Certification Labels indicating that doors comply with requirements of grades specified.



- 2. Contract Documents contain selections chosen from options in quality standard and additional requirements beyond those of quality standard. Comply with those selections and requirements in addition to quality standard.
  
- B. Low-Emitting Materials: Fabricate doors with adhesives and composite wood products that do not contain urea formaldehyde.
  
- C. Low-Emitting Materials: Fabricate doors that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers." All composite wood and agrifiber products must meet this requirement. Prefer products that are third party certified through SCS Indoor Advantage Gold.
  
- D. WDMA I.S.1-A Performance Grade: Heavy Duty.
  
- E. Fire-Rated Wood Doors: 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 10C.
  - 1. Cores: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
  - 2. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
  - 3. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.
  - 4. Pairs: Provide formed-steel edges and astragals with intumescent seals.
    - a. Finish steel edges and astragals with baked enamel[same color as doors].
    - b. Finish steel edges and astragals to match door hardware (locksets or exit devices).
  
- F. Mineral-Core Doors:
  - 1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
  - 2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as follows:
    - a. 5-inch top-rail blocking.
    - b. 5-inch bottom-rail blocking, in doors indicated to have protection plates.
    - c. 5-inch midrail blocking, in doors indicated to have armor plates.
    - d. 4-1/2-by-10-inch lock blocks, in doors indicated to have exit devices.
  - 3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.
    - a. Screw-Holding Capability: 550 lbf per WDMA T.M.-10.

2.3 VENEER-FACED DOORS FOR TRANSPARENT FINISH

- A. Interior Solid-Core Doors:
  - 1. Grade: Premium, with Grade A faces .
  - 2. Species: Select white birch .
  - 3. Cut: Plain sliced (flat sliced) .
  - 4. Match between Veneer Leaves: Slip match.



5. Assembly of Veneer Leaves on Door Faces: Balance match.
6. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
7. Room Match: Match door faces within each separate room or area of building. Corridor-door faces do not need to match where they are separated by 10 feet or more.
8. Room Match: Provide door faces of compatible color and grain within each separate room or area of building.
9. Transom Match: End match.
10. Exposed Vertical Edges: Same species as faces - edge Type A.
11. Core: Either glued wood stave or structural composite lumber .
12. Construction: Five or seven plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering. Faces are bonded to core using a hot press.
13. WDMA I.S.1-A Performance Grade: Standard Duty.

#### 2.4 LIGHT FRAMES AND LOUVERS

- A. Metal Frames for Light Openings in Fire-Rated Doors: Manufacturer's standard frame formed of 0.048-inch- thick, cold-rolled steel sheet; with baked-enamel- or powder-coated finish; and approved for use in doors of fire-protection rating indicated.

#### 2.5 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
  1. Comply with NFPA 80 requirements for fire-rated doors.
- B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.
  1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
  2. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.
- C. Transom and Side Panels: Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles.
  1. Fabricate door and transom panels with full-width, solid-lumber, rabbeted, meeting rails. Provide factory-installed spring bolts for concealed attachment into jambs of metal door frames.
- D. Openings: Factory cut and trim openings through doors.
  1. Light Openings: Trim openings with moldings of material and profile indicated.
  2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 088000 "Glazing."
  3. Louvers: Factory install louvers in prepared openings.



## 2.6 FACTORY FINISHING

- A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
  - 1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.
- B. Factory finish doors.
- C. Transparent Finish:
  - 1. Grade: Custom.
  - 2. Finish: Manufacturer's standard UV cured polyurethane, equal to WDMA TR-6 catalyzed polyurethane.
  - 3. Effect: Filled finish.
  - 4. Sheen: Satin.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine doors and installed door frames, with Installer present, before hanging doors.
  - 1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
  - 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Hardware: For installation, see Section 087100 "Door Hardware."
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
  - 1. Install fire-rated doors according to NFPA 80.
- C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

### 3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

**END OF SECTION 08 14 16**



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## SECTION 08 31 13 - ACCESS DOORS AND FRAMES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section includes access doors and frames for walls and ceilings.

#### 1.3 ALLOWANCES

- A. Access doors and frames are part of an access door and frame allowance.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

### PART 2 - PRODUCTS

#### 2.1 ACCESS DOORS AND FRAMES

- A. Flush Access Doors with Exposed Flanges:
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide Acudor UF-5000 Universal Access door or comparable product by one of the following:
    - a. Babcock-Davis.
    - b. JL Industries, Inc.; a division of the Activar Construction Products Group.
    - c. Larsens Manufacturing Company.
    - d. MIFAB, Inc.
    - e. Milcor; Commercial Products Group of Hart & Cooley, Inc.
    - f. Nystrom, Inc.
  - 3. Door Size: 24" x 24" .
  - 4. Metallic-Coated Steel Sheet for Door: Nominal 0.079 inch (1.59 mm), 14 gage, factory finished.
  - 5. Stainless-Steel Sheet for Door: Nominal 0.075 inch , 14 gage, No. 4 finish.
  - 6. Frame Material: Same material as door. Nominal 0.064 inch (1.59 mm), 16 gage metallic-Coated Steel Sheet or Nominal 0.060 inch (1.59 mm), 16 gage for Stainless-Steel.
  - 7. Latch and Lock: Cam latch, screwdriver operated .



**2.2 MATERIALS**

- A. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 or A60 metallic coating.
- B. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304. Remove tool and die marks and stretch lines, or blend into finish.

**2.3 FINISHES**

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Painted Finishes: Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
  - 1. Factory Finished: Apply manufacturer's standard baked-enamel or powder-coat finish immediately after cleaning and pretreating, with minimum dry-film thickness of 1 mil for topcoat.
- D. Stainless-Steel Finishes:
  - 1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

**3.2 INSTALLATION**

- A. Comply with manufacturer's written instructions for installing access doors and frames.

**3.3 ADJUSTING**

- A. Adjust doors and hardware, after installation, for proper operation.

**END OF SECTION 08 31 13**



## 08 36 13 SECTIONAL DOORS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section includes operated sectional doors.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type and size of sectional door and accessory.
  - 1. Include construction details, material descriptions, dimensions of individual components, profile door sections, and finishes.
  - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Sample Warranties: For special warranties.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For sectional doors to include in maintenance manuals.

#### 1.6 QUALITY ASSURANCE

- A. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.
- B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and California Building Code.

#### 1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of sectional doors that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures including, but not limited to, excessive deflection.
    - b. Failure of components or operators before reaching required number of operation cycles.
    - c. Faulty operation of hardware.
    - d. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use; rust through.



- e. Delamination of exterior or interior facing materials.
  - 2. Warranty Period: Two years from date of Substantial Completion.
- B. Special Finish Warranty: Manufacturer agrees to repair or replace components that show evidence of deterioration of factory-applied finishes within specified warranty period.
- 1. Warranty Period: 10 years from date of Substantial Completion.

**PART 2 - PRODUCTS**

2.1 MANUFACTURERS, GENERAL

- A. Source Limitations: Obtain sectional doors from single source from single manufacturer.
  - 1. Obtain operators and controls from sectional door manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. General Performance: Sectional doors shall comply with performance requirements specified without failure due to defective manufacture, fabrication, installation, or other defects in construction and without requiring temporary installation of reinforcing components.
- B. Structural Performance, Exterior Doors: Capable of withstanding the design wind loads.
  - 1. Design Wind Load: Uniform pressure (velocity pressure) of 20 lbf/sq. ft., and acting inward and outward.
  - 2. Testing: According to ASTM E 330.
  - 3. Deflection Limits: Design sectional doors to withstand design wind loads without evidencing permanent deformation or disengagement of door components.
    - a. Deflection of door sections in horizontal position (open) shall not exceed 1/120 of the door width.
    - b. Deflection of horizontal track assembly shall not exceed 1/240 of the door height.
  - 4. Operability under Wind Load: Design overhead coiling doors to remain operable under design wind load, acting inward and outward.
- C. Windborne-Debris Impact Resistance: Provide glazed sectional doors that pass missile-impact and cyclic-pressure tests according to ASTM E 1996 for Wind Zone 1 or ANSI / DASHMA 115.
  - 1. Large Missile Test: For overhead coiling doors located within 30 feet of grade.
- D. Seismic Performance: Sectional doors shall withstand the effects of earthquake motions determined according to ASCE / SEI 7.
  - 1. Component Importance Factor: 1.5.

2.3 DOOR ASSEMBLY

- A. Aluminum Sectional Door: Sectional door formed with hinged sections and fabricated according to DASHMA 102 unless otherwise indicated.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide Overhead Door Corporation Model 521 or comparable product by one of the following:
    - a. Haas Door.



- b. Raynor.
- c. Wayne-Dalton Corp.
  
- B. Operation Cycles: Door components and operators capable of operating for not less than 100,000 cycles. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.
  
- C. Air Infiltration: Maximum rate of at 15 and 25 mph when tested according to ASTM E 283.
  
- D. Aluminum Sections: Solid panels.
  
- E. Track Configuration: Standard-lift track.
  
- F. Weatherseals: Fitted to bottom and top of door. Provide combination bottom weatherseal and sensor edge.
  
- G. Windows: Approximately and spaced apart in row(s) at height indicated on Drawings; installed with glazing of the following type:
  - 1. Clear Float Glass: 3 mm thick and complying with ASTM C 1036, Type I, Class 1, Quality Q3.
  
- H. Roller-Tire Material: Manufacturer's standard.
  
- I. Counterbalance Type: Torsion spring.
  
- J. Electric Motor Operation: Provide UL listed electric operator, size and type as recommended by manufacturer to move door in either direction at not less than 2/3 foot nor more than 1 foot per second. Operator shall meet UL325/2010 requirements for continuous monitoring of safety devices.
  
- K. Door Finish:
  - 1. Baked-Enamel or Powder-Coat Polyester Finish: Color and gloss as selected by City from manufacturer's full range.

**2.4 MATERIALS, GENERAL**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

**2.5 TRACKS, SUPPORTS, AND ACCESSORIES**

- A. Tracks: Manufacturer's standard, galvanized-steel track system of configuration indicated, sized for door size and weight, designed for lift type indicated and clearances indicated on Drawings, Provide complete system including brackets, bracing, and reinforcement to ensure rigid support of ball-bearing roller guides for required door type, size, weight, and loading.
  - 1. Galvanized Steel: ASTM A 653/A 653M, minimum G60 zinc coating.
  - 2. Slope tracks at an angle from vertical or design tracks to ensure tight closure at jambs when door unit is closed.



- B. Weatherseals: Replaceable, adjustable, continuous, compressible weather-stripping gaskets of flexible vinyl, rubber, or neoprene fitted to bottom and top of sectional door unless otherwise indicated.

## 2.6 HARDWARE

- A. General: Heavy-duty, corrosion-resistant hardware, with hot-dip galvanized, stainless-steel, or other corrosion-resistant fasteners, to suit door type.
- B. Hinges: Heavy-duty, galvanized-steel hinges of not less than 0.079-inch- nominal coated thickness at each end stile and at each intermediate stile, according to manufacturer's written recommendations for door size. Attach hinges to door sections through stiles and rails with bolts and lock nuts or lock washers and nuts. Use rivets or self-tapping fasteners where access to nuts is impossible. Provide double-end hinges where required, for doors more than 16 feet wide unless otherwise recommended by door manufacturer.
- C. Rollers: Heavy-duty rollers with steel ball-bearings in case-hardened steel races, mounted with varying projections to suit slope of track. Extend roller shaft through both hinges where double hinges are required. Provide 3-inch- diameter roller tires for 3-inch- wide track and 2-inch- diameter roller tires for 2-inch- wide track.
- D. Push/Pull Handles: Equip each push-up operated or emergency-operated door with galvanized-steel lifting handles on each side of door, finished to match door.

## 2.7 COUNTERBALANCE MECHANISM

- A. Bumper: Provide spring bumper at each horizontal track to cushion door at end of opening operation.

## 2.8 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM / NOMMA's "Metal Finishes Manual for Architectural and Metal Products (AMP 500-06)" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
- B. Examine locations of electrical connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.



### 3.2 INSTALLATION

- A. Install sectional doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
- B. Tracks:
  - 1. Fasten vertical track assembly to opening jambs and framing, spaced not more than 24 inches apart.
  - 2. Hang horizontal track assembly from structural overhead framing with angles or channel hangers attached to framing by welding or bolting, or both. Provide sway bracing, diagonal bracing, and reinforcement as required for rigid installation of track and door-operating equipment.
- C. Accessibility: Install sectional doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.
- D. Power-Operated Doors: Install automatic garage doors openers according to UL 325.

### 3.3 STARTUP SERVICES

- A. Engage a factory-authorized service representative to perform startup service.
  - 1. Complete installation and startup checks according to manufacturer's written instructions.
  - 2. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

### 3.4 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.
- C. Adjust doors and seals to provide weather-resistant fit around entire perimeter.
- D. Touch-up Painting: Immediately after welding galvanized materials, clean welds and abraded galvanized surfaces and repair galvanizing to comply with ASTM A 780/A 780M.

### 3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train City's maintenance personnel to adjust, operate, and maintain sectional doors.

**END OF SECTION 08 36 13**



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## 08 51 13 ALUMINUM WINDOWS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section includes aluminum windows for exterior locations.

#### 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  2. Review and discuss the finishing of aluminum windows that is required to be coordinated with the finishing of other aluminum work for color and finish matching.
  3. Review, discuss, and coordinate the interrelationship of aluminum windows with other exterior wall components. Include provisions for anchoring, flashing, weeping, sealing perimeters, and protecting finishes.
  4. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.
  5. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  1. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for aluminum windows.
- B. Shop Drawings: For aluminum windows.
  1. Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

#### 1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer capable of fabricating aluminum windows that meet or exceed performance requirements indicated and of documenting this performance by test reports and calculations.



1.7 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Failure to meet performance requirements.
    - b. Structural failures including excessive deflection, water leakage, condensation, and air infiltration.
    - c. Faulty operation of movable sash and hardware.
    - d. Deterioration of materials and finishes beyond normal weathering.
    - e. Failure of insulating glass.
  - 2. Warranty Period:
    - a. Window: 10 years from date of Substantial Completion.
    - b. Glazing Units: 20 years from date of Substantial Completion.
    - c. Aluminum Finish: 20 years from date of Substantial Completion.

**PART 2 - PRODUCTS**

2.1 MANUFACTURERS

- A. Source Limitations: Obtain aluminum windows from single source from single manufacturer.

2.2 ALUMINUM WINDOWS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following;
- B. Basis-of-Design Product: Subject to compliance with requirements, provide Arcadia T200 Series or comparable product by one of the following:
  - 1. Vistawall Architectural Products.
  - 2. EFCO Corporation.
  - 3. Kawneer North America; an Alcoa Company.
- C. Operating Types: Provide the following operating types in locations indicated on Drawings:
  - 1. Casement: Projected.
- D. Insulating-Glass Units: ASTM E 2190.
  - 1. Glass: ASTM C 1036, Type 1, Class 1, q3.
    - a. Tint: Clear.
    - b. Kind: Fully tempered.
  - 2. Filling: Fill space between glass lites with argon. .
  - 3. Low-E Coating: Pyrolytic on second surface.
  - 4. Integral Louver Blinds: Glass manufacturer's standard, horizontal louver blinds with aluminum slats and polyester fiber cords, located in space between glass lites, and operated by hardware located on inside face of sash.
    - a. Operation: Tilt only.
    - b. Color: As selected by City from manufacturer's full range.
- E. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal.



- F. Hardware, General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with adjacent materials; designed to smoothly operate, tightly close, and securely lock windows, and sized to accommodate sash weight and dimensions.
  - 1. Exposed Hardware Color and Finish: As selected by City from manufacturer's full range.
- G. Projected Window Hardware:
  - 1. Gear-Type Rotary Operators: Complying with AAMA 901 when tested according to ASTM E 405, Method A. Provide operators that function without requiring the removal of interior screens or using screen wickets.
  - 2. Hinges: Non-friction type, not less than two per sash.
  - 3. Lock: Lever handle and cam-action lock with keeper.
- H. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.

### 2.3 INSECT SCREENS

- A. General: Fabricate insect screens to integrate with window frame. Provide screen for each operable exterior sash. Screen wickets are not permitted.
  - 1. Type and Location: sashes.
- B. Aluminum Frames: Manufacturer's standard aluminum alloy complying with SMA 1004 or SMA 1201. Fabricate frames with mitered or coped joints or corner extrusions, concealed fasteners, and removable PVC spline/anchor concealing edge of frame.
  - 1. Tubular Framing Sections and Cross Braces: Roll formed from aluminum sheet.
- C. Aluminum Wire Fabric: 18-by-16 mesh of 0.011-inch- diameter, coated aluminum wire.
  - 1. Wire-Fabric Finish: Charcoal gray.

### 2.4 DEFLECTION HEADS

- A. General: Provide extruded deflection head for window assembly to permit structural movement at opening. Finish to match window frame.

### 2.5 FABRICATION

- A. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.
- B. Glaze aluminum windows in the factory.
- C. Weather strip each operable sash to provide weathertight installation.
- D. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.
- E. Provide water-shed members above side-hinged sashes and similar lines of natural water penetration.



- F. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation.

## 2.6 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## 2.7 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify rough opening dimensions, levelness of sill plate, and operational clearances.
- C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure weathertight window installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E 2112.
- B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.



- C. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.
- D. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

**3.3 ADJUSTING, CLEANING, AND PROTECTION**

- A. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.
- B. Clean exposed surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
  - 1. Keep protective films and coverings in place until final cleaning.
- C. Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written instructions.

**END OF SECTION 08 51 13**



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## SECTION 08 53 13 – VINYL WINDOWS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section includes vinyl-framed windows.

#### 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  - 2. Review, discuss, and coordinate the interrelationship of vinyl windows with other exterior wall components. Include provisions for anchoring, flashing, weeping, sealing perimeters, and protecting finishes.
  - 3. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.
  - 4. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, glazing, and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for vinyl windows.
- B. Shop Drawings: For vinyl windows.
  - 1. Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

#### 1.6 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace vinyl windows that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Failure to meet performance requirements.
    - b. Structural failures including excessive deflection, water leakage, and air infiltration.



- c. Faulty operation of movable sash and hardware.
- d. Deterioration of materials and finishes beyond normal weathering.
- e. Failure of insulating glass.
2. Warranty Period:
  - a. Window: 10 years from date of Substantial Completion.
  - b. Glazing Units: 20 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Source Limitations: Obtain vinyl windows from single source from single manufacturer.

### 2.2 WINDOW PERFORMANCE REQUIREMENTS

- A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.
  1. Window Certification: WDMA certified with label attached to each window.
- B. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.30 Btu/sq. ft. x h x deg F.
- C. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC of 0.40.
- D. Outside-Inside Transmission Class (OITC): Rated for not less than 30 OITC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 1332.

### 2.3 VINYL WINDOWS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Pella Corporation 350 Series Casement Window with integral fin or comparable product by one of the following:
  1. Jeld-Wen, Inc.
  2. Kolbe & Kolbe Millwork Co., Inc.
  3. Milgard Manufacturi
- B. Operating Types: Provide the following operating types in locations indicated on Drawings:
  1. Casement: Project out.
- C. Glass: Clear annealed glass, ASTM C 1036, Type 1, Class 1, q3.
  1. Kind: Fully tempered where indicated on Drawings.
- D. Insulating-Glass Units: ASTM E 2190.
  1. Lites: Two.
  2. Filling: Fill space between glass lites with argon.
  3. Low-E Coating: Pyrolytic on second surface.





- 4. Integral Louver Blinds: Glass manufacturer's standard, horizontal louver blinds with aluminum slats and polyester fiber cords, located in space between glass lites, and operated by hardware located on inside face of sash.
  - a. Operation: Tilt only.
  - b. Color: White.
  
- E. Glazing System:
  - 1. Dual Glazing System:
    - a. Interior Lite: Glass.
    - b. Exterior Lite: Insulating-glass unit.
  
- F. Hardware, General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with adjacent materials; designed to smoothly operate, tightly close, and securely lock windows, and sized to accommodate sash weight and dimensions.
  - 1. Exposed Hardware Color and Finish: As indicated by manufacturer's designations.
  
- G. Projected Window Hardware:
  - 1. Gear-Type Rotary Operators: Complying with AAMA 901 when tested according to ASTM E 405, Method A. Provide operators that function without requiring the removal of interior screens or using screen wickets.
    - a. Type and Style: As selected by Architect from manufacturer's full range of types and styles.
  - 2. Hinges: Stainless-steel hinges with stainless-steel-reinforced, sliding nylon shoes.
  - 3. Single-Handle Locking System: Operates positive-acting arms that pull sash into locked position. Provide one arm on sashes up to 29 inches tall and two arms on taller sashes.
  - 4. Limit Devices: limit devices designed to restrict sash opening.
    - a. Limit clear opening to 4 inches for ventilation; with custodial key release.
  - 5. Pole Operators: Tubular-shaped anodized aluminum; with rubber-capped lower end and standard push-pull hook at top to match hardware design; of sufficient length to operate window without reaching more than 60 inches above floor; one pole operator and pole hanger per room that has operable windows more than 72 inches above floor.
  
- H. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.

**2.4 INSECT SCREENS**

- A. General: Fabricate insect screens to integrate with window frame. Provide screen for each operable exterior sash. Screen wickets are not permitted.
  - 1. Type and Location: sashes.
  
- B. Aluminum Frames: Manufacturer's standard aluminum alloy complying with SMA 1004 or SMA 1201. Fabricate frames with mitered or coped joints or corner extrusions, concealed fasteners, and removable PVC spline/anchor concealing edge of frame.
  - 1. Finish for Interior Screens: Baked-on organic coating in color selected by City from manufacturer's full range.
  - 2. Finish for Exterior Screens: match window frames.
  
- C. Aluminum Wire Fabric: 18-by-16 mesh of 0.011-inch- diameter, coated aluminum wire.
  - 1. Wire-Fabric Finish: Charcoal gray.



## 2.5 FABRICATION

- A. Fabricate vinyl windows in sizes indicated. Include a complete system for installing and anchoring windows.
- B. Glaze vinyl windows in the factory.
- C. Weather strip each operable sash to provide weathertight installation.
- D. Window Assemblies: Provide operating units in configuration indicated. Provide window frames, sashes, hardware, and other trim and components necessary for a complete, secure, and weathertight installation, including the following:
  - 1. Angled mullion posts with interior and exterior trim.
  - 2. Angled interior and exterior extension and trim.
  - 3. Clear pine head and seat boards.
  - 4. Top and bottom plywood platforms.
  - 5. Exterior head and sill casings and trim.
  - 6. Support brackets.
- E. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation. Allow for scribing, trimming, and fitting at Project site.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify rough opening dimensions, levelness of sill plate, and operational clearances.
- C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure weathertight window installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E 2112.
- B. Install windows level, plumb, square, true to line, without distortion, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.



3.3 ADJUSTING, CLEANING, AND PROTECTION

- A. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.
- B. Clean exposed surfaces immediately after installing windows. Remove excess sealants, glazing materials, dirt, and other substances.
  - 1. Keep protective films and coverings in place until final cleaning.
- C. Remove and replace sashes if glass has been broken, chipped, cracked, abraded, or damaged during construction period.
- D. Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written instructions.

**END OF SECTION 08 53 13**



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## SECTION 08 62 00 - UNIT SKYLIGHTS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Unit skylights mounted on curbs.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of unit skylight.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for unit skylights.
- B. Shop Drawings: For unit skylight work.
  - 1. Include plans, elevations, sections, details, and connections to supporting structure and other adjoining work.
  - 2. Multiple Units: Methods of connection and structural support for multiple units clustered together.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For unit skylights to include in maintenance manuals.

#### 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer capable of fabricating unit skylights that meet or exceed performance requirements indicated and of documenting this performance by inclusion in lists and by labels, test reports, and calculations.
- B. Installer Qualifications: An installer acceptable to unit skylight manufacturer for installation of units required for this Project.

#### 1.6 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of unit skylights that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Uncontrolled water leakage.
    - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
    - c. Yellowing of acrylic glazing.
  - 2. Warranty Period: Five years from date of Substantial Completion.



## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide Wasco, DDCA3636 or comparable product by one of the following:
  - 1. Bristolite Skylights.
  - 2. Naturalite Skylight Systems; Oldcastle Glass Engineered Products.
  - 3. Plasteco, Inc.
  - 4. VELUX America Inc.

### 2.2 PERFORMANCE REQUIREMENTS

- A. Unit Skylight Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated
  - 1. Performance Class and Grade: Class CW PG 30.

### 2.3 UNIT SKYLIGHTS

- A. General: Provide factory-assembled unit skylights that include glazing, extruded-aluminum glazing retainers, gaskets, and inner frames and that are capable of withstanding performance requirements indicated.
- B. Unit Shape and Size: Square, 30-by-30-inch inside curb.
- C. Acrylic Glazing: ASTM D 4802, thermoformable, monolithic sheet, category as standard with manufacturer, Finish 1 (smooth or polished), Type UVF (formulated with UV absorber).
  - 1. Double-Glazing Profile: Dome, 25 percent rise.
    - a. Thicknesses: Not less than thicknesses required to exceed performance requirement.
    - b. Outer Glazing Color: Colorless, transparent.
    - c. Inner Glazing Color: White, translucent.
  - 2. Self-Ignition Temperature: 650 deg F or more for plastic sheets in thickness indicated when tested according to ASTM D 1929.
  - 3. Smoke-Production Characteristics: Smoke-developed index of 450 or less when tested according to ASTM E 84, and smoke density of 75 or less when tested according to ASTM D 2843
  - 4. Burning Characteristics: Tested according to ASTM D 635. Class CC2, burning rate of 2-1/2 inches per minute or less for nominal thickness of 0.060 inch or thickness indicated for use.
- D. Glazing Gaskets: EPDM, neoprene, partially vulcanized butyl tape, or liquid-applied elastomeric sealant.
- E. Condensation Control: Fabricate unit skylights with integral internal gutters and nonclogging weeps to collect and drain condensation to the exterior.



- F. Thermal Break: Fabricate unit skylights with thermal barrier separating exterior and interior metal framing.
- G. Integral Curbs: Fabricate from double skin of aluminum, insulated with 1 inch of polyisocyanurate insulation R-6. Provide thermal break at top and bottom. Provide 0.025 inch inner skin and 0.032 inch outer skin.

#### 2.4 ACCESSORY MATERIALS

- A. Fasteners: Same metal as metal being fastened, nonmagnetic stainless steel, or other noncorrosive metal as recommended by manufacturer. Finish exposed fasteners to match material being fastened.
  - 1. Where removal of exterior exposed fasteners might allow access to building, provide nonremovable fastener heads.
- B. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mildry film thickness per coat.

#### 2.5 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

### **PART 3 - EXECUTION**

#### 3.1 EXAMINATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION

- A. Coordinate installation of unit skylight with installation of substrates, vapor retarders, roof insulation, roofing membrane, and flashing as required to ensure that each element of the Work performs properly and that combined elements are waterproof and weathertight.
- B. Comply with recommendations in AAMA 1607 and with manufacturer's written instructions for installing unit skylights.
- C. Install unit skylights level, plumb, and true to line, without distortion.
- D. Anchor unit skylights securely to supporting substrates.
- E. Where aluminum surfaces of unit skylights will contact another metal or corrosive substrates, such as preservative-treated wood, apply bituminous coating on concealed metal surfaces or provide other approved permanent separation recommended in writing by unit skylight manufacturer.



**3.3 CLEANING**

- A. Clean exposed unit skylight surfaces according to manufacturer's written instructions. Touch up damaged metal coatings and finishes.
- B. Remove excess sealants, glazing materials, dirt, and other substances.
- C. Remove and replace glazing that has been broken, chipped, cracked, abraded, or damaged during construction period.
- D. Protect unit skylight surfaces from contact with contaminating substances resulting from construction operations.

**END OF SECTION 08 62 00**





## 08 71 00 DOOR HARDWARE

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Mechanical door hardware for the following:
    - a. Swinging doors.
  - 2. Cylinders for door hardware specified in other Sections.

#### 1.3 COORDINATION

- A. Floor-Recessed Door Hardware: Coordinate layout and installation with floor construction.
  - 1. Cast anchoring inserts into concrete.
- B. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. 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. Security: Coordinate installation of door hardware, keying, and access control with the City.
- D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.
- E. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

#### 1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Conference participants shall include Installer's Architectural Hardware Consultant.
- B. Keying Conference: Conduct conference at Project site.
  - 1. Conference participants shall include Installer's Architectural Hardware Consultant.
  - 2. Incorporate conference decisions into keying schedule after reviewing door hardware keying system including, but not limited to, the following:
    - a. Flow of traffic and degree of security required.
    - b. Preliminary key system schematic diagram.
    - c. Requirements for key control system.
    - d. Requirements for access control.
    - e. Address for delivery of keys.



## 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
  
- B. Door Hardware Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant. Coordinate door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
  - 1. Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule.
  - 2. Format: Use same scheduling sequence and format and use same door numbers as in door hardware schedule in the Contract Documents.
  - 3. Content: Include the following information:
    - a. Identification number, location, hand, fire rating, size, and material of each door and frame.
    - b. Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
    - c. Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
    - d. Fastenings and other installation information.
    - e. Explanation of abbreviations, symbols, and designations contained in door hardware schedule.
    - f. Mounting locations for door hardware.
  
- C. Keying Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant, detailing City's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents.

## 1.6 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

## 1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of door hardware to include in maintenance manuals.
- B. Schedules: Final door hardware and keying schedule.

## 1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Door Hardware: supply one extra of each type of lockset and deadbolt, two extra of each closer and door pull, and six extra of each type of hinge.



1.9 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
- B. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.
- C. Deliver keys to manufacturer of key control system for subsequent delivery to City.
- D. Deliver keys and permanent cores to City by registered mail or overnight package service.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures including excessive deflection, cracking, or breakage.
    - b. Faulty operation of doors and door hardware.
    - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
    - d. Locksets: Five years from Substantial Completion.
    - e. Exit Devices: Two years from date of Substantial Completion.
    - f. Manual Closers: 10 years from date of Substantial Completion.

**PART 2 - PRODUCTS**

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Door Assemblies: Where fire-rated doors are indicated, provide door hardware complying with NFPA 80 that is listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
- B. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the DOJ's "2010 ADA Standards for Accessible Design" and current California Building Code.
  - 1. 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.
  - 2. Adjust door closer sweep periods so that, from an open position of 90 degrees, the door will take at least 5 seconds to move to a position of 12 degrees from the latch.
  - 3. Adjust spring hinges so that, from an open position of 70 degrees, the door will take at least 1.5 seconds to move to the closed position.

2.2 SCHEDULED DOOR HARDWARE

- A. Provide products for each door that comply with requirements indicated in Part 2 and door hardware schedule.
  - 1. Door hardware is scheduled in Part 3.



## 2.3 HINGES

- A. Hinges: BHMA A156.1. Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated in door hardware schedule:
    - a. Baldwin Hardware Corporation.
    - b. Hager Companies.
    - c. McKinney Products Company; an ASSA ABLOY Group company.
    - d. Stanley Commercial Hardware; a division of Stanley Security Solutions.

## 2.4 MECHANICAL LOCKS AND LATCHES

- A. Lock Functions: As indicated in door hardware schedule.
- B. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
  - 1. Bored Locks: Minimum 1/2-inch latchbolt throw.
  - 2. Deadbolts: Minimum 1-inch bolt throw. Solid stainless steel bolt.
- C. Lock Backset: 2-3/4 inches unless otherwise indicated.
- D. Lock Trim:
  - 1. Levers: Forged.
    - a. Best Access Systems; Stanley Security Solutions, Inc; lever 14 with H rose.
- E. Mortise Locks: BHMA A156.13; Operational Grade 1; Series 1000. Stamped steel case with steel or brass parts.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated in door hardware schedule:
    - a. Best Access Systems; Stanley Security Solutions, Inc. No substitutions.

## 2.5 LOCK CYLINDERS

- A. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated in door hardware schedule:
    - a. Best Access Systems; Stanley Security Solutions, Inc. No substitutions.
- B. Standard Lock Cylinders: BHMA A156.5; permanent cores; face finished to match lockset.
  - 1. Core Type: Removable.



2.6 KEYING

- A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, appendix. Provide one extra key blank for each lock.
  - 1. Existing System:
    - a. Master key or grand master key locks to City's existing system.
- B. Keys:
  - 1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:
    - a. Notation: Information to be furnished by City.

2.7 ACCESSORIES FOR PAIRS OF DOORS

- A. Astragals: BHMA A156.22.

2.8 SURFACE CLOSERS

- A. Surface Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written instructions for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide Norton Series 7500 Series closer or comparable product by one of the following:
    - a. Corbin Russwin, Inc.; an ASSA ABLOY Group company.
    - b. DORMA Architectural Hardware; a division of DORMA Group North America.
    - c. SARGENT Manufacturing Company; an ASSA ABLOY Group company.
    - d. LCN a division of Allegion.

2.9 DOOR GASKETING

- A. Door Gasketing: BHMA A156.22; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide Pemko Manufacturing Co. HSS2000xS88GR or comparable product by one of the following:
    - a. Hager Companies.
    - b. National Guard Products, Inc.
    - c. Zero International, Inc.

2.10 THRESHOLDS

- A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide Pemko Manufacturing Co. 156A or comparable product by one of the following:



- a. Hager Companies.
- b. National Guard Products, Inc.
- c. Zero International, Inc.

2.11 FLUSH MODULAR RAMP THRESHOLD ASSEMBLY

- A. Thresholds: BHMA A156.21; fabricated to full width as indicated on drawings. Ramp and flared side ramp slope shall be 1:12. Miter the ramp and side ramp as required.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide Pemko Manufacturing Co. R1.25FMR or comparable product by one of the following:
    - a. Hager Companies.
    - b. National Guard Products, Inc.
    - c. Zero International, Inc.

2.12 METAL EDGE PROTECTIVE TRIM UNITS

- A. Metal Edge Protective Trim Units: BHMA A156.6; fabricated from 0.050-inch- thick stainless steel; with manufacturer's standard machine or self-tapping screw fasteners.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide Type 430, 16 Gauge stainless steel with No. 4 finish, and beveled mounting holes for stainless steel screws by InPro Corporation or comparable product by one of the following:
    - a. Allegion plc.
    - b. Rockwood Manufacturing Company; an ASSA ABLOY Group company.
    - c. Trimco.

2.13 DOOR SWEEPS

- A. Door Sweeps: with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide Pemko Manufacturing Co. 18137DNB or comparable product by one of the following:
    - a. Hager Companies.
    - b. National Guard Products, Inc.
    - c. Zero International, Inc.

2.14 FINISHES

- A. Provide finishes complying with BHMA A156.18. Supply ANSI/BHMI 626 or ANSI/BHMI 630 for locksets. ANSI/BHMI 626 for aluminum thresholds, seals, and weatherstripping. Push and pull handle and plates, and kick plate finishes are specified in door schedule.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.



- C. 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.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance of the Work.
- B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

- A. Steel Doors and Frames: For surface-applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
- B. Wood Doors: Comply with door and hardware manufacturers' written instructions.

### **3.3 INSTALLATION**

- A. Mounting Heights: Mount door hardware units at heights indicated on Drawings unless otherwise indicated or required to comply with governing regulations.
  - 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
  - 2. Custom Steel Doors and Frames: HMMA 831.
  - 3. Wood Doors: DHI's "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.
  - 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
  - 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- C. Hinges: Install types and in quantities indicated in door hardware schedule, but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.





- D. Intermediate Offset Pivots: Where offset pivots are indicated, provide intermediate offset pivots in quantities indicated in door hardware schedule, but not fewer than one intermediate offset pivot per door and one additional intermediate offset pivot for every 30 inches of door height greater than 90 inches .
- E. Lock Cylinders: Install construction cores to secure building and areas during construction period.
  - 1. Replace construction cores with permanent cores as directed by City.
  - 2. Furnish permanent cores to City for installation.
- F. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 079200 "Joint Sealants."
- G. Stops: Provide wall stops for doors unless floor or other type stops are indicated in door hardware schedule.
- H. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
  - 1. Do not notch perimeter gasketing to install other surface-applied hardware.
- I. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- J. Door Sweeps: Apply to bottom of door, forming seal with threshold when door is closed.

### 3.4 FIELD QUALITY CONTROL

- A. Independent Architectural Hardware Consultant: City will engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.
  - 1. Independent Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

### 3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
  - 1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
  - 2. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 70 degrees and so that closing time complies with accessibility requirements of authorities having jurisdiction.
- B. Occupancy Adjustment: Approximately three months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

### 3.6 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.





- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.7 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions for City's continued adjustment, maintenance, and removal and replacement of door hardware.
- B. Maintenance Service: Beginning at Substantial Completion, maintenance service shall include **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 and door hardware operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

3.8 DEMONSTRATION

- A. Engage Installer to train City's maintenance personnel to adjust, operate, and maintain door hardware.

3.9 HARDWARE SCHEDULE

- A. Provide hardware for each door to comply with requirements of this section, hardware set numbers indicated in door schedule; and in the following schedule of hardware sets.

**HW-01 Building Entrance**

- Lock: 45H-7-A
- Hinges: As Specified
- Closer: As Specified
- Stop: As Specified
- Door Gasket: As Specified
- Threshold: As Specified

**HW-02 Building Entrance**

- Lock: 45H-7-A
- Hinges: As Specified
- Closer: As Specified
- Stop: As Specified
- Door Gasket: As Specified
- Drip: As Specified
- Threshold: As Specified

**HW-03 Storeroom**

- Lock: 45H-7-D
- Flushbolts: As Specified
- Hinges: As Specified
- Astragal: As Specified
- Door Gasket: As Specified
- Drip: As Specified





Threshold: As Specified

**HW-04 Panics**

Panic Device: TS2314LDxM4914D  
Hinges: As Specified  
Closer: As Specified  
Stop: As Specified  
Closer: As Specified  
Door Gasket: As Specified  
Threshold: As Specified

**HW-05 Passage**

Lock: 45H-0-N  
Hinges: As Specified  
Closer: As Specified  
Stop: As Specified  
Door Gasket: As Specified

**HW-06 Passage**

Lock: 45H-0-N  
Hinges: As Specified  
Stop: As Specified

**HW-07 Privacy**

Lock: 45H-0-L-VIN  
Hinges: As Specified  
Closer: As Specified  
Stop: As Specified

**HW-08 Privacy**

Lock: 45H-0-L  
Hinges: As Specified  
Stop: As Specified

**END OF SECTION 087100**



## SECTION 09 24 00 - CEMENT PLASTERING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Exterior vertical plasterwork (stucco).
  - 2. Exterior horizontal and nonvertical plasterwork (stucco).

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store materials inside under cover, and keep them dry and protected against damage from weather, moisture, direct sunlight, surface contamination, corrosion, construction traffic, and other causes.

#### 1.5 FIELD CONDITIONS

- A. Comply with ASTM C 926 requirements.
- B. Exterior Plasterwork:
  - 1. Apply and cure plaster to prevent plaster drying out during curing period. Use procedures required by climatic conditions, including moist curing, providing coverings, and providing barriers to deflect sunlight and wind.
  - 2. Apply plaster when ambient temperature is greater than 40 deg F.
  - 3. Protect plaster coats from freezing for not less than 48 hours after set of plaster coat has occurred.
- C. Interior Plasterwork: Maintain room temperatures at greater than 40 deg F for at least 48 hours before plaster application, and continuously during and after application.
  - 1. Avoid conditions that result in plaster drying out during curing period. Distribute heat evenly; prevent concentrated or uneven heat on plaster.
  - 2. Ventilate building spaces as required to remove water in excess of that required for hydrating plaster in a manner that prevents drafts of air from contacting surfaces during plaster application and until plaster is dry.



**PART 2 - PRODUCTS**

**2.1 METAL LATH**

- A. Expanded-Metal Lath: ASTM C 847, cold-rolled carbon-steel sheet with ASTM A 653/A 653M, G60, hot-dip galvanized-zinc coating.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide CEMCO; California Expanded Metal Products Co. Diamond Metal Lath (Expanded) without paper, 2.5 pounds per square yard, or comparable product by one of the following:
    - a. CEMCO; California Expanded Metal Products Co.
    - b. ClarkDietrich Building Systems.
    - c. Phillips Manufacturing Co.

**2.2 ACCESSORIES**

- A. General: Comply with ASTM C 1063, and coordinate depth of trim and accessories with thicknesses and number of plaster coats required.
- B. Metal Accessories:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:
    - a. CEMCO; California Expanded Metal Products Co.
    - b. ClarkDietrich Building Systems.
    - c. Phillips Manufacturing Co.
    - d. Fry Reglet Architectural Metals.
  - 3. Foundation Weep Screed: Fabricated from hot-dip galvanized-steel sheet, ASTM A 653/A 653M, G60 zinc coating. CEMCO No. 36 Foundation Sill Screed or equal.
  - 4. External- (Outside-) Corner Reinforcement: Fabricated from metal lath with ASTM A 653/A 653M, G60, hot-dip galvanized-zinc coating. CEMCO No 2-A Corner Bead or equal.
  - 5. Casing Beads: Fabricated from zinc-coated (galvanized) steel; square-edged style; with expanded flanges. CEMCO #66 Expanded Flange Case Bead or equal.
  - 6. Control Joints: Fabricated from zinc-coated (galvanized) steel; one-piece-type, folded pair of unperforated screeds in M-shaped configuration; with perforated flanges and removable protective tape on plaster face of control joint. CEMCO #15 Double "V" Control Joint and #30 Corner Expansion Joint or equal.
  - 7. Two-Piece Expansion Joints: Fabricated from zinc-coated (galvanized) steel; formed to produce slip-joint and square-edged reveal that is adjustable from 1/4 to 5/8 inch wide; with perforated flanges. Clark Dietrich#40 Two Piece Expansion Joint or equal.
  - 8. Drip Screed: Extruded Clear Anodize Aluminum. Fry Reglet DS-875-V-875 or equal.

**2.3 MISCELLANEOUS MATERIALS**

- A. Water for Mixing and Finishing Plaster: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.



- B. Fiber for Base Coat: Alkaline-resistant glass or polypropylene fibers, 1/2 inch long, free of contaminants, manufactured for use in cement plaster.
- C. Fasteners for Attaching Metal Lath to Substrates: ASTM C 1063.
- D. Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, not less than 0.0475-inch diameter unless otherwise indicated.

#### 2.4 PLASTER MATERIALS

- A. Portland Cement: ASTM C 150/C 150M, Type I.
- B. Lime: ASTM C 206, Type S; or ASTM C 207, Type S.
- C. Perlite Aggregate: ASTM C 35.
- D. Exposed Aggregates for Finish Coats:
- E. Acrylic-Based Finish Coatings: Factory-mixed acrylic-emulsion coating systems formulated with colorfast mineral pigments and fine aggregates; for use over cement plaster base coats. Include manufacturer's recommended primers and sealing topcoats for acrylic-based finishes.
  - 1. Products: Subject to compliance with requirements, provide the following:
    - a. El Rey Stucco Solutions; a Parex USA, Inc. brand.; Perma-Flex Smooth Finish.
    - b. Senergy, BASF Wall Systems, Inc.; Senerflex Fine.
    - c. SonoWall, BASF Wall Systems, Inc.; StuccoTex Fine Finish
    - d. Sto Corp.; StoPowerwall Fine Finish.
    - e. Stuc-O-Flex International, Inc.; Elastomeric Finish, Fine.
  - 2. Color: Match existing finish.

#### 2.5 PLASTER MIXES

- A. General: Comply with ASTM C 926 for applications indicated.
  - 1. Fiber Content: Add fiber to base-coat mixes after ingredients have mixed at least two minutes. Comply with fiber manufacturer's written instructions for fiber quantities in mixes, but do not exceed 1 lb of fiber/cu. yd. of cementitious materials.
- B. Job-Mixed Finish-Coat Mixes:
  - 1. Portland Cement Mix: For cementitious materials, mix 1 part portland cement and 3/4 to 1-1/2 parts lime. Use 1-1/2 to 3 parts aggregate per part of cementitious material.
- C. Factory-Prepared Finish-Coat Mixes: For acrylic-based finish coatings, comply with manufacturer's written instructions.



## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Protect adjacent work from soiling, spattering, moisture deterioration, and other harmful effects caused by plastering.
- B. Prepare smooth, solid substrates for plaster according to ASTM C 926.

### 3.3 INSTALLING METAL LATH

- A. Metal Lath: Install according to ASTM C 1063.
  - 1. On Solid Surfaces, Not Otherwise Furred: Install self-furring, diamond-mesh lath.

### 3.4 INSTALLING ACCESSORIES

- A. Install according to ASTM C 1063 and at locations indicated on Drawings.
- B. Reinforcement for External (Outside) Corners:
  - 1. Install lath-type, external-corner reinforcement at exterior locations.
- C. Control Joints: Locate as approved by City for visual effect and as follows:
  - 1. As required to delineate plasterwork into areas (panels) of the following maximum sizes:
    - a. Vertical Surfaces: 144 sq. ft..
    - b. Horizontal and Other Nonvertical Surfaces: 100 sq. ft..
  - 2. At distances between control joints of not greater than 18 feet o.c.
  - 3. As required to delineate plasterwork into areas (panels) with length-to-width ratios of not greater than 2-1/2:1.
  - 4. Where control joints occur in surface of construction directly behind plaster.
  - 5. Where plasterwork areas change dimensions, to delineate rectangular-shaped areas (panels) and to relieve the stress that occurs at the corner formed by the dimension change.

### 3.5 PLASTER APPLICATION

- A. General: Comply with ASTM C 926.
  - 1. Do not deviate more than plus or minus 1/4 inch in 10 feet from a true plane in finished plaster surfaces when measured by a 10-foot straightedge placed on surface.
  - 2. Finish plaster flush with metal frames and other built-in metal items or accessories that act as a plaster ground unless otherwise indicated. Where casing bead does not terminate plaster at metal frame, cut base coat free from metal frame before plaster sets and groove finish coat at junctures with metal.



3. Provide plaster surfaces that are ready to receive field-applied finishes indicated.
  - B. Acrylic-Based Finish Coatings: Apply coating system, including primers, finish coats, and sealing topcoats, according to manufacturer's written instructions.
  - C. Concealed Exterior Plasterwork: Where plaster application is used as a base for adhered finishes, omit finish coat.
- 3.6 PLASTER REPAIRS
  - A. Repair or replace work to eliminate cracks, dents, blisters, buckles, crazing and check cracking, dry outs, efflorescence, sweat outs, and similar defects and where bond to substrate has failed.
- 3.7 CLEANING AND PROTECTION
  - A. Remove temporary protection and enclosure of other work after plastering is complete. Promptly remove plaster from door frames, windows, and other surfaces not indicated to be plastered. Repair floors, walls, and other surfaces stained, marred, or otherwise damaged during plastering.

**END OF SECTION 09 24 00**



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## SECTION 09 29 00 - GYPSUM BOARD

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Interior gypsum board.
  - 2. Tile backing panels.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

#### 1.4 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

#### 1.5 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, moisture damaged, and mold damaged.
  - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

### PART 2 - PRODUCTS

#### 2.1 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

#### 2.2 INTERIOR GYPSUM BOARD

- A. Gypsum Wallboard: ASTM C 1396/C 1396M.





1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Georgia-Pacific Building Products.
    - b. National Gypsum Company.
    - c. PABCO Gypsum.
    - d. USG.
  3. Core: 5/8 inch.
  4. Long Edges: Tapered.
- B. Gypsum Ceiling Board: ASTM C 1396/C 1396M.
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Georgia-Pacific Building Products.
    - b. National Gypsum Company.
    - c. PABCO Gypsum.
    - d. USG.
  3. Core: 5/8 inch .
  4. Long Edges: Tapered.
- C. Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Georgia-Pacific Building Products.
    - b. National Gypsum Company.
    - c. PABCO Gypsum.
    - d. USG.
  3. Core: 5/8 inch .
  4. Long Edges: Tapered.
  5. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

### 2.3 TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or ASTM C 1325, with manufacturer's standard edges.
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. C-Cure.
    - b. CertainTeed Corporation.
    - c. James Hardie Building Products, Inc.
    - d. United States Gypsum Company.
  3. Thickness: 1/2 inch .
  4. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.



2.4 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
  - 1. Material: Paper-faced galvanized-steel sheet.
  - 2. Shapes:
    - a. Cornerbead.
    - b. Bullnose bead.
    - c. Expansion (control) joint.

2.5 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
  - 1. Interior Gypsum Board: Paper.
  - 2. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.

**PART 3 - EXECUTION**

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.



- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
  - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
  - 2. Fit gypsum panels around ducts, pipes, and conduits.
  - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch- wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members or provide control joints to counteract wood shrinkage.
- J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

### 3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
  - 1. Wallboard Type: Vertical surfaces unless otherwise indicated.
  - 2. Ceiling Type: Ceiling surfaces.
  - 3. Mold-Resistant Type: As indicated on Drawings.
- B. Single-Layer Application:
  - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
  - 2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
    - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
    - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
  - 3. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
  - 4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- C. Multilayer Application:



1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
  2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
  3. On Z-shaped furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
  4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.
- D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written instructions and temporarily brace or fasten gypsum panels until fastening adhesive has set.
- E. Curved Surfaces:
1. Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus 12-inch- long straight sections at ends of curves and tangent to them.
  2. For double-layer construction, fasten base layer to studs with screws 16 inches o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12 inches o.c.

### 3.4 APPLYING TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Panels: Comply with manufacturer's written installation instructions and install at locations indicated to receive tile. Install with 1/4-inch gap where panels abut other construction or penetrations.
- B. Cementitious Backer Units: ANSI A108.11, at shower walls and where indicated.
- C. Water-Resistant Backing Board: Install where indicated with 1/4-inch gap where panels abut other construction or penetrations.
- D. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

### 3.5 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.



- B. Control Joints: Install control joints at locations according to ASTM C 840 and in specific locations approved by City for visual effect.
- C. Interior Trim: Install in the following locations:
  - 1. Cornerbead: Use at outside corners unless otherwise indicated.
  - 2. Bullnose Bead: Use for matching existing outside corners at Fire Station #8.

### 3.6 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
  - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
  - 2. Level 2: Panels that are substrate for tile.
  - 3. Level 5: For all visible areas.
- E. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.
- F. Cementitious Backer Units: Finish according to manufacturer's written instructions.

### 3.7 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
  - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

**END OF SECTION 09 29 00**



## SECTION 09 30 13 - CERAMIC TILING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Porcelain tile.
  - 2. Stone thresholds.
  - 3. Tile backing panels.
  - 4. Waterproof membrane.
  - 5. Metal edge strips.

#### 1.3 DEFINITIONS

- A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in its "Specifications for Installation of Ceramic Tile."
- C. Module Size: Actual tile size plus joint width indicated.
- D. Face Size: Actual tile size, excluding spacer lugs.

#### 1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.





- D. Store liquid materials in unopened containers and protected from freezing.

## 1.6 FIELD CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Source Limitations for Tile: Obtain tile of each type and color or finish from single source or producer.
  - 1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer and each aggregate from single source or producer.
  - 1. Obtain waterproof membrane and crack isolation membrane, except for sheet products, from manufacturer of setting and grouting materials.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer:
  - 1. Stone thresholds.
  - 2. Waterproof membrane.
  - 3. Metal edge strips.

### 2.2 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
  - 1. Provide tile complying with Standard grade requirements.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.
- C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.
- D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.
  - 1. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.





2.3 TILE PRODUCTS

- A. Ceramic Tile Type CT-1: Unglazed porcelain tile for floors.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide Daltile City View or comparable product by one of the following:
    - a. American Olean; a division of Dal-Tile Corporation.
    - b. Crossville, Inc.
    - c. Interceramic.
  - 3. Certification: Tile certified by the Porcelain Tile Certification Agency.
  - 4. Face Size Variation: Rectified.
  - 5. Face: Plain with square or cushion edges.
  - 6. Dynamic Coefficient of Friction: Not less than 0.42.
  - 7. Tile Size, Color, Glaze, and Pattern: 12” x 24”. Color will be selected by City from manufacturer’s standard offerings. Pattern is ½ tile offset in the longest direction of tile.
  - 8. Grout Color: Match tile color.
  - 9. Cove Tile: Supply at tile floor edges to wall. Match field tile color.
  
- B. Ceramic Tile Type CT-2: Unglazed porcelain tile for floors.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide Daltile Veranda Tones or comparable product by one of the following:
    - a. American Olean; a division of Dal-Tile Corporation.
    - b. Crossville, Inc.
    - c. Interceramic.
  - 3. Certification: Tile certified by the Porcelain Tile Certification Agency.
  - 4. Face Size Variation: Rectified.
  - 5. Face: Plain with square or cushion edges.
  - 6. Dynamic Coefficient of Friction: Not less than 0.42.
  - 7. Tile Size, Color, Glaze, and Pattern: 6 ½” x 6 ½”. Color will be selected by City from manufacturer’s standard offerings.
  - 8. Grout Color: Match tile color.
  - 9. Cove Tile: Supply at tile floor edges to wall. Match field tile color.
  
- C. Ceramic Tile Type CT-3: Unglazed porcelain tile for walls.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide Daltile Veranda Solids or comparable product by one of the following:
    - a. American Olean; a division of Dal-Tile Corporation.
    - b. Crossville, Inc.
    - c. Interceramic.
  - 3. Certification: Tile certified by the Porcelain Tile Certification Agency.
  - 4. Face Size Variation: Rectified.
  - 5. Face: Plain with square or cushion edges.
  - 6. Dynamic Coefficient of Friction: Not less than 0.42.
  - 7. Tile Size, Color, Glaze, and Pattern: 6 ½” x 13”. Color will be selected by City from manufacturer’s standard offerings.
  - 8. Grout Color: Match tile color.





## 2.4 THRESHOLDS

- A. General: Fabricate stone to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
  - 1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch or less above adjacent floor surface.

## 2.5 WATERPROOF MEMBRANE

- A. General: Manufacturer's standard product, that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
  - 1. Chlorinated Polyethylene Sheet: Nonplasticized, chlorinated polyethylene faced on both sides with nonwoven polyester fabric; 0.030-inch nominal thickness.
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide Nobleseal TS, Noble Company (The) or comparable product by the following:
    - a. Schuter Systems.
    - b. Laticrete International.

## 2.6 GROUT MATERIALS

- A. Water-Cleanable Epoxy Grout: ANSI A118.3, with a VOC content of 65 g/L or less.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide Fusion Pro Single Component Grout, Custom Building Products, Seal Beach, CA or comparable product by one of the following:
    - a. Bonsal American, an Oldcastle company.
    - b. C-Cure.
    - c. Laticrete International, Inc.
    - d. MAPEI Corporation.
  - 3. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 and 212 deg F, respectively, and certified by manufacturer for intended use.

## 2.7 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.



## 2.8 MISCELLANEOUS MATERIALS

- A. Metal Edge Strips: Angle or L-shaped, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; stainless-steel, ASTM A 666, 300 Series exposed-edge material.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Schluter Systems L.P.; Schiene EV4A or comparable product by one of the following:
    - a. Blanke Corporation.
    - b. Ceramic Tool Company, Inc.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
  - 1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
  - 2. Verify that concrete substrates for tile floors installed with thinset mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
    - a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
    - b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
  - 3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
  - 4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with City.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with adhesives or thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.
- C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.



### 3.3 CERAMIC TILE INSTALLATION

- A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
  - 1. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:
    - a. Tile floors in wet areas.
    - b. Tile floors consisting of tiles 8 by 8 inches or larger.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
- E. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.
- F. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
  - 1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
  - 2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
  - 3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.
- G. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
  - 1. Porcelain Tile: 3/16 inch.
- H. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- I. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
  - 1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
- J. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.



1. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in modified dry-set mortar (thinset).
  2. Do not extend cleavage membrane under thresholds set in modified dry-set mortar. Fill joints between such thresholds and adjoining tile set on cleavage membrane with elastomeric sealant.
- K. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.
- 3.4 TILE BACKING PANEL INSTALLATION
- A. Install panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated.
- 3.5 WATERPROOFING INSTALLATION
- A. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.
- B. Allow waterproofing to cure and verify by testing that it is watertight before installing tile or setting materials over it.
- 3.6 ADJUSTING AND CLEANING
- A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.
- B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
1. Remove grout residue from tile as soon as possible.
  2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
- 3.7 PROTECTION
- A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
- B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

**END OF SECTION 09 30 13**



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## SECTION 09 65 13 - RESILIENT BASE AND ACCESSORIES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Resilient base.
  - 2. Resilient stair accessories.
  - 3. Resilient molding accessories.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

#### 1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Furnish not less than 10 linear feet 200 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

#### 1.6 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following time periods:
  - 1. 48 hours before installation.
  - 2. During installation.
  - 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F .
- C. Install resilient products after other finishing operations, including painting, have been completed.



**PART 2 - PRODUCTS**

**2.1 PERFORMANCE REQUIREMENTS**

- A. Low-Emitting Materials: Flooring system shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

**2.2 THERMOSET-RUBBER BASE**

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 1. Burke Mercer Flooring Products, Division of Burke Industries Inc.
  - 2. Flexco.
  - 3. Roppe Corporation, USA.
- B. Product Standard: ASTM F 1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).
  - 1. Style and Location:
    - a. Style B, Cove: Provide in areas with resilient flooring.
- C. Thickness: 0.125 inch.
- D. Height: 4 inches .
- E. Lengths: Coils in manufacturer's standard length .
- F. Outside Corners: premanufactured moulded wall base corners.
- G. Inside Corners: Preformed premanufactured moulded wall base corners.
- H. Colors: Color will be selected by City from manufacturer’s standard offerings.

**2.3 RUBBER STAIR ACCESSORIES**

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 1. Burke Mercer Flooring Products, Division of Burke Industries Inc.
  - 2. Flexco.
  - 3. Johnsonite; A Tarkett Company.
  - 4. Mondo Rubber International, Inc.
  - 5. Roppe Corporation, USA.
- B. Stair Treads: ASTM F 2169.
  - 1. Type: TS (rubber, vulcanized thermoset).
  - 2. Class: 2 (pattern; embossed, grooved, or ribbed).
  - 3. Group: 2 (with contrasting color for the visually impaired).
  - 4. Nosing Style: Square, adjustable to cover angles between 60 and 90 degrees.
  - 5. Nosing Height: 2 inches .
  - 6. Thickness: 1/4 inch and tapered to back edge.







- 7. Size: Lengths and depths to fit each stair tread in one piece.
- 8. Integral Risers: Smooth, flat; in height that fully covers substrate.
  
- C. Separate Risers: Smooth, flat; in height that fully covers substrate; produced by same manufacturer as treads and recommended by manufacturer for installation with treads.
  - 1. Style: Toeless, by length matching treads.
  - 2. Thickness: 0.125 inch.
  
- D. Locations: Provide rubber stair accessories in areas indicated on drawings.
  
- E. Colors and Patterns: Color will be selected by City from manufacturer’s standard offerings.

**2.4 RUBBER MOLDING ACCESSORY**

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 1. Johnsonite; A Tarkett Company.
  - 2. Roppe Corporation, USA.
  - 3. VPI, LLC, Floor Products Division.
  
- B. Description: Rubber reducer strip for resilient flooring.
  
- C. Profile and Dimensions: As indicated.
  
- D. Locations: Provide rubber molding accessories in areas indicated.
  
- E. Colors and Patterns: Color will be selected by City from manufacturer’s standard offerings.

**2.5 INSTALLATION MATERIALS**

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.
  
- B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.
  - 1. Adhesives shall have a VOC content of 50 g/L or less.
  
- C. Stair-Tread Nose Filler: Two-part epoxy compound recommended by resilient stair-tread manufacturer to fill nosing substrates that do not conform to tread contours.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
  - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.



- B. Proceed with installation only after unsatisfactory conditions have been corrected.
  - 1. Installation of resilient products indicates acceptance of surfaces and conditions.

### 3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces according to ASTM F 710.
  - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
  - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
  - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
  - 4. Moisture Testing: Proceed with installation only after substrates pass testing according to manufacturer's written recommendations, but not less stringent than the following:
    - a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
    - b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have maximum 75 percent relative humidity level.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install resilient products until they are the same temperature as the space where they are to be installed.
  - 1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

### 3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.



- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Preformed Corners: Install preformed corners before installing straight pieces.

#### 3.4 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Stair Accessories:
  - 1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
  - 2. Tightly adhere to substrates throughout length of each piece.
  - 3. For treads installed as separate, equal-length units, install to produce a flush joint between units.
- C. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

#### 3.5 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
- B. Perform the following operations immediately after completing resilient-product installation:
  - 1. Remove adhesive and other blemishes from exposed surfaces.
  - 2. Sweep and vacuum horizontal surfaces thoroughly.
  - 3. Damp-mop horizontal surfaces to remove marks and soil.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

**END OF SECTION 09 65 13**



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## SECTION 09 65 19 - RESILIENT TILE FLOORING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Solid vinyl floor tile.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: Full-size units of each color and pattern of floor tile required.
  - 1. For heat-welding bead, manufacturer's standard-size Samples, but not less than 9 inches long, of each color required.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

#### 1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Floor Tile: Furnish one box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces.

#### 1.7 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following time periods:
  - 1. 48 hours before installation.
  - 2. During installation.
  - 3. 48 hours after installation.



- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F .
- C. Close spaces to traffic during floor tile installation.
- D. Close spaces to traffic for 48 hours after floor tile installation.
- E. Install floor tile after other finishing operations, including painting, have been completed.

## **PART 2 - PRODUCTS**

### **2.1 SOLID VINYL FLOOR TILE**

- A. Products: Subject to compliance with requirements, provide product by the following:
  - 1. Amtico International Inc.
  - 2. Armstrong World Industries, Inc.
  - 3. Burke Mercer Flooring Products, Division of Burke Industries Inc.
  - 4. Flexco, Inc.
  - 5. IVC, Part of Mohawk Industries Inc.
  - 6. Johnsonite; A Tarkett Company.
  - 7. Roppe Corporation, USA.
- B. Tile Standard: ASTM F 1700.
  - 1. Class: Class II, surface-decorated vinyl tile .
  - 2. Type: B, embossed surface.
- C. Thickness: 0.177 inch .
- D. Size: 7.52 inches by 51.81 inches .
- E. Installation Method: Gluedown.
- F. Colors and Patterns: IVC US Luxury Vinyl Plank, color Ontario Oak 24536.

### **2.2 INSTALLATION MATERIALS**

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.
- C. Floor Polish: Provide protective, liquid floor-polish products recommended by floor tile manufacturer.



## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
  - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
  - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
  - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
  - 3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
  - 4. Moisture Testing: Proceed with installation only after substrates pass testing according to floor tile manufacturer's written recommendations, but not less stringent than the following:
    - a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
    - b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum 90 percent relative humidity level.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor tiles until they are the same temperature as the space where they are to be installed.
  - 1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

### 3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.



- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
  - 1. Lay tiles square with room axis.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
  - 1. Lay tiles with grain running in one direction.
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

#### 3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.
- B. Perform the following operations immediately after completing floor tile installation:
  - 1. Remove adhesive and other blemishes from exposed surfaces.
  - 2. Sweep and vacuum surfaces thoroughly.
  - 3. Damp-mop surfaces to remove marks and soil.
- C. Cover floor tile until Substantial Completion.

**END OF SECTION 09 65 19**





## SECTION 09 91 13 - EXTERIOR PAINTING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following exterior substrates:
  1. Concrete masonry units (CMUs).
  2. Cement Plaster.
  3. Steel and iron.
  4. Galvanized metal.
  5. Wood.

#### 1.3 DEFINITIONS

- A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- D. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- E. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- F. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
  1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
  2. Indicate VOC content.
- B. Samples for Verification: For each type of paint system and each color and gloss of topcoat.
  1. Submit Samples on rigid backing, 8 inches square.
  2. Apply coats on Samples in steps to show each coat required for system.
  3. Label each coat of each Sample.
  4. Label each Sample for location and application area.



1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
  - 1. Maintain containers in clean condition, free of foreign materials and residue.
  - 2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

**PART 2 - PRODUCTS**

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
- B. Basis-of-Design Product: Products of Sherwin-Williams Co. are basis of design. Subject to compliance and City review, equivalent products by the following will be considered:
  - 1. Benjamin Moore & Co.
  - 2. Dunn-Edwards Corporation.
  - 3. Frazee Paint; Comex Group.

2.2 PAINT, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."
- B. VOC Content: For field applications, paints and coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
  - 1. Nonflat Paints and Coatings: 50 g/L.

**PART 3 - EXECUTION**

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.



- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
  - 1. Masonry (Clay and CMUs): 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- D. Proceed with coating application only after unsatisfactory conditions have been corrected.
  - 1. Application of coating indicates acceptance of surfaces and conditions.

### 3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
  - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
  - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.

### 3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
  - 1. Use applicators and techniques suited for paint and substrate indicated.
  - 2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
  - 3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
  - 4. Paint entire exposed surface of window frames and sashes.
  - 5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
  - 6. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.



- B. Tint undercoats same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work. Follow manufacturer's recommendation for given substrates:
  - 1. Paint the following work where exposed to the exterior and view:
    - a. Equipment, including panelboards and switch gear.
    - b. Uninsulated metal piping.
    - c. Uninsulated plastic piping.
    - d. Pipe hangers and supports.
    - e. Metal conduit.
    - f. Tanks that do not have factory-applied final finishes.

### 3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: City may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
  - 1. Contractor shall touch up and restore painted surfaces damaged by testing.
  - 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

### 3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.



3.6 EXTERIOR PAINTING SCHEDULE

- A. CMU and Cement Plaster Substrates:
  - 1. Latex System: Dry film thickness of not less than 5 mils .
    - a. Prime Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300.
    - b. Intermediate Coat: Same as topcoat.
    - c. Topcoat: S-W A-100 Exterior Latex Flat A6 Series.
  - 2. Elastomeric System Alternate: Total dry film thickness of not less than 12 mils.
    - a. Prime Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300.
    - b. Intermediate Coat: Same as topcoat.
    - c. Topcoat: S-W Conflex, A5-400.
- B. Steel and Iron Substrates:
  - 1. Latex System: Dry film thickness of not less than 5 mils .
    - a. Prime Coat: S-W ProIndustrial Acrylic Metal Primer.
    - b. Intermediate Coat: Same as topcoat.
    - c. Topcoat: S-W Pro Industrial Acrylic Semigloss B66-650.
- C. Galvanized Metal Substrates:
  - 1. Latex System: Dry film thickness of not less than 5 mils .
    - a. Prime Coat: S-W ProIndustrial Acrylic Metal Primer.
    - b. Intermediate Coat: Same as topcoat.
    - c. Topcoat: : S-W Pro Industrial Acrylic Semigloss B66-650.
- D. Wood Substrates:
  - 1. Latex System: Dry film thickness of not less than 5 mils .
    - a. Prime Coat: S-W Durakote Latex Primer.
    - b. Intermediate Coat: Same as topcoat.
    - c. Topcoat: Latex, S-W A-100 Exterior Latex Satin, A82 Series.

**END OF SECTION 09 91 13**



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## SECTION 09 91 23 - INTERIOR PAINTING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following interior substrates:
  - 1. Concrete masonry units (CMUs).
  - 2. Wood.
  - 3. Gypsum board.
  - 4. Plaster.

#### 1.3 DEFINITIONS

- A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. MPI Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- D. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- E. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- F. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- G. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
  - 1. Include Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
  - 2. Indicate VOC content.
- B. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.
  - 1. Submit Samples on rigid backing, 8 inches square.
  - 2. Apply coats on Samples in steps to show each coat required for system.



3. Label each coat of each Sample.
4. Label each Sample for location and application area.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
  1. Maintain containers in clean condition, free of foreign materials and residue.
  2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

**PART 2 - PRODUCTS**

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:
  1. Benjamin Moore & Co.
  2. Dulux (formerly ICI Paints); a brand of AkzoNobel.
  3. Dunn-Edwards Corporation.
  4. Duron, Inc.
  5. Frazee Paint; Comex Group.
  6. Glidden Professional.
  7. PPG Architectural Finishes, Inc.
  8. Pratt & Lambert.
  9. Sherwin-Williams Company (The).
- C. Products: Subject to compliance with requirements, provide product listed in the Interior Painting Schedule for the paint category indicated.

2.2 PAINT, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."





- B. Material Compatibility:
  - 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
  - 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- C. VOC Content: For field applications that are inside the weatherproofing system, paints and coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
  - 1. Nonflat Paints and Coatings: 50 g/L.
- D. Low-Emitting Materials: For field applications that are inside the weatherproofing system, 90 percent of paints and coatings shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- E. Colors: As indicated in a color schedule.
  - 1. Twenty percent of surface area will be painted with deep tones.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
  - 1. Masonry (Clay and CMUs): 12 percent.
  - 2. Wood: 15 percent.
  - 3. Gypsum Board: 12 percent.
  - 4. Plaster: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Plaster Substrates: Verify that plaster is fully cured.
- E. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- F. Proceed with coating application only after unsatisfactory conditions have been corrected.
  - 1. Application of coating indicates acceptance of surfaces and conditions.

#### **3.2 PREPARATION**

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.



- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
  - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
  - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.
- E. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- F. Wood Substrates:
  - 1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
  - 2. Sand surfaces that will be exposed to view, and dust off.
  - 3. Prime edges, ends, faces, undersides, and backsides of wood.
  - 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

### 3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
  - 1. Use applicators and techniques suited for paint and substrate indicated.
  - 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
  - 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
  - 4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
  - 5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.



- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
  - a.
  - 2. Paint the following work where exposed in occupied spaces:
    - a. Equipment, including panelboards.
    - b. Uninsulated metal piping.
    - c. Uninsulated plastic piping.
    - d. Pipe hangers and supports.
    - e. Metal conduit.
    - f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
    - g. Other items as directed by the City.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: City may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
  - 1. Contractor shall touch up and restore painted surfaces damaged by testing.
  - 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

- A. CMU Substrates:
  - 1. Latex System :
    - a. Block Filler: Block filler, latex, interior/exterior.
      - 1) S-W PrepRite ProBlock Primer, B51W00620, at 400 sq. ft. per gal.
    - b. Intermediate Coat: Latex, interior, matching topcoat.



- c. Topcoat: Latex, interior (MPI Gloss Level 3).
  - 1) S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series, at 4.0 mils wet, 1.7 mils dry, per coat.
  
- B. Wood Substrates: Wood trim.
  - 1. Latex over Latex Sealer System:
    - a. Prime Coat: Primer sealer, latex, interior.
      - 1) S-W PrepRite ProBlock Primer, B51W00620, at 400 sq. ft. per gal.
    - b. Intermediate Coat: Latex, interior, matching topcoat.
    - c. Topcoat: Latex, interior (MPI Gloss Level 3).
      - 1) S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series, at 4.0 mils wet, 1.7 mils dry, per coat.
  
- C. Gypsum Board and Plaster Substrates:
  - 1. Latex over Latex Sealer System:
    - a. Prime Coat: Primer sealer, latex, interior.
      - 1) S-W PrepRite ProBlock Primer, B51W00620, at 400 sq. ft. per gal.
    - b. Intermediate Coat: Latex, interior, matching topcoat.
    - c. Topcoat: Latex, interior (MPI Gloss Level 3).
      - 1) S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series, at 4.0 mils wet, 1.7 mils dry, per coat.

**END OF SECTION 09 91 23**



## SECTION 10 14 00 - SIGNAGE

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Wall Mount Signs.

#### 1.2 SUBMITTALS

##### A. Submit Shop Drawings to detail manufactured or fabricated items. Indicate materials, dimensions, finishes, and details of construction, including full size sections of typical members. Depict all fabrication joints, fasteners, and substrates.

1. Full Size Layout: Sign face, letter spacing, full text in correct font, edge or frame of sign.
2. Templates: Furnish full-size spacing templates for individually mounted dimensional letters and numbers
3. Camera-Ready Artwork: Submit full-size artwork or high quality photocopies artwork for approval. If copies are submitted, they must be suitable for judging sharpness of art and alignment.

##### B. Color/Finish Sample: Submit all colors specified: Two samples of each color on actual sign background material.

1. Full Size Sample: Provide one complete sign of each type to serve as comprehensive submittal showing color, material, layout, and construction.

#### 1.3 QUALITY ASSURANCE

##### A. Sign Fabricator Qualifications: Firm experienced in producing signs similar to this Project, with record of successful in-service performance, and sufficient production capacity to produce signs required without causing delay in Work.

##### B. Design Concept: Drawings indicate sizes, profiles, materials, images, arrangements, construction and dimensional requirements of signs.

##### C. Copy: Lettering shown on sign type Drawings is intended as guideline for layouts and type size only. All spelling and punctuation must be correct.

1. Materials: New stock, free from defects impairing strength, durability or appearance. All fabrication and installation in accordance with highest standards of trade. All signs and components free from visual and mechanical defects



2. Painted Surfaces and Other Applied Finishes: Smooth even finish free of marks, scratches, dirt embedments, or wave irregularities
  3. Align all letterforms to maintain a baseline parallel to sign format. Maintain margins as specified in sign type layouts
  4. Replace all damaged sign surfaces and materials before Substantial Completion.
- D. Produce smooth, level sign surfaces, constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally.

#### 1.4 REGULATORY REQUIREMENTS

- A. ADA Compliance: All sign fabrication and installation must conform to most restrictive, recent and currently-in-force applicable sections of Americans with Disabilities Act (ADA) of 1990, Americans with Disabilities Act Accessibility Guidelines (ADAAG), publications of American National Standards Institute (ANSI), California Building Code, and International Building Code.

### **PART 2 - PRODUCTS**

#### 2.1 MATERIALS

- A. Cast Acrylic Sheet: Provide cast (not extruded or continuous cast) methyl methacrylate monomer plastic sheet, in sizes and thickness indicated, with a minimum flexural strength of 16,000 psi when tested according to ASTM D 790, with minimum allowable continuous service temperature of 176° F, and of the following general types:
1. Transparent Sheet: Where sheet material is indicated as clear, provide colorless sheet in matte finish, with light transmittance of 92 percent, when tested according to the requirements of ASTM D 1003.
  2. Opaque Sheet: Where sheet material is indicated as "opaque," provide colored opaque acrylic sheet in colors and finishes indicated.
- B. Adhesives: Use in accordance with recommendations made by manufacturer of material to be laminated or adhered. Do not use adhesives that will fade, discolor, or delaminate as a result of ultraviolet light or heat.
- C. Foam Tape: 1/16" thick.
- D. Silicone Adhesive: Ready to use, high performance adhesive. General Electric GE 1200 sealant, translucent SCS 1201 or equal as recommended by manufacturer for bonding condition.
- E. Adhesive Tape: Double-sided tape: 3M 467MP or approved equal, to be used for laminating tactile magnesium inserts to acrylic substrate.
- F. Fasteners: Concealed fasteners fabricated from metals not corrosive to sign material and mounting surface. Do not penetrate sign-face surfaces during fabrication or installation of signs.



- G. Fasteners: Resistant to oxidation or other corrosive action. Secure work with fasteners of same color and finish as components they secure, where exposed to view. Perform fabrication with fasteners in strict accordance with manufacturer’s specifications, directions, and recommendations, and as indicated on Shop Drawings.
- H. Paints: Note exact identification of all paints on Shop Drawings and paint sample submittals. Provide paints that will not fade, discolor, or delaminate as a result of ultraviolet light or heat. Prime coats or other surface pretreatments, where recommended by manufacturer of paint, are required. Guarantee preparation, primer and finish coats for five (5) years against pitting, peeling, or fading. Apply all inks, paints, lacquers without pinholes, scratches, orange peeling, application marks, etc. For exterior signs, additional protective coating is required to assure color integrity and abrasion resistance.

## 2.2 FINISHES

- A. Colors and Surfaces Textures: For exposed sign material that requires selection of materials with integral or applied colors, surface textures or other characteristics related to appearance, provide color matches indicated, as selected by City from manufacturer’s standards.
- B. Metal Finishes: Comply with NAAMM “Metal Finishes Manual” for finish designations and applications recommendations.

## 2.3 COPY

- A. Typesetting: Submit full size patterns for review of letter form and spacing prior to fabrication. Type style as indicated on Drawings.
- B. Raised Copy and/or Graphics: Raised with clean edges, 1/32 inch minimum. Remove all saw marks and chips prior to installation. Locate Braille copy below raised letter copy, with dots in color to match background.
- C. Etched or Engraved Copy: Etch letters, numbers, symbols, and other graphic devices into sign panel on the face indicated to produce precisely formed copy, incised to uniform depth.

## 2.4 WALL MOUNT SIGNS

- A. Basis of Design: Subject to compliance with Specifications, products by these manufacturers may be submitted:
  - 1. ACE ([acesign.com](http://acesign.com)).
  - 2. Advance ([advancecorp.com](http://advancecorp.com)).
  - 3. APCO ([apcosigns.com](http://apcosigns.com)).
  - 4. ASI-Modulex ([asimodulex.com](http://asimodulex.com)).
  - 5. Best Sign Systems ([bestsigns.com](http://bestsigns.com)).
  - 6. Bunting Graphics ([buntinggraphics.com](http://buntinggraphics.com)).
  - 7. Innerface Sign Systems ([innerfacesigns.com](http://innerfacesigns.com)).
  - 8. InPro ([inprocorp.com](http://inprocorp.com)).
  - 9. Kroy Sign Systems ([kroysignsystems.com](http://kroysignsystems.com)).





10. Mohawk Sign Systems (mohawksign.com).

## 2.5 ACCESSORIES

- A. Fasteners: Use concealed fasteners fabricated from metals that are noncorrosive to sign material and mounting surface.
- B. Anchors and Inserts: Nonferrous metal or hot-dip galvanized anchors and inserts. Use toothed steel or lead expansion-bolt devices for drilled-in-place anchors.

## PART 3 – EXECUTION

### 3.1 INSPECTION

- A. General: Inspect project for physical conditions of each substrate or location to which signs will be attached. Notify City in writing of conditions unsatisfactory for installation. Do not proceed with installation until unsatisfactory conditions have been corrected.

### 3.2 SIGN CONSTRUCTION AND INSTALLATION

- A. General: Locate sign units and accessories where indicated, using mounting methods of type described and in compliance with manufacturer's instructions.
  1. Coordinate anchor details and materials with City. Notify City in writing of all conditions detrimental to proper and timely installation of sign work.
  2. Letter and Sign Fabrication: A complete system including all stiffeners, fasteners, welding, sealants, jointing, miscellaneous pieces and material thickness as required to form high quality workmanship. Connections, angles, shapes and details shown must be sized, reinforced and detailed as required.
  3. Do not make changes in visual elements without City's prior review and written approval.
- B. Installation:
  1. Deliver materials to Project site in as large a fabrication as possible, protected from damage. Store in appropriate location away from heavy traffic before installation. Handle carefully to avoid damage. Scratched or dented materials will be rejected.
  2. Inspect all signs for evidence of damage before installation.
  3. Examine conditions and substrates under which installation is to be performed and notify City in writing of all unsatisfactory conditions. Do not proceed with work until unsatisfactory conditions have been corrected or subsequent change of location has been indicated.
  4. Follow all recommendations and instructions for installation as provided by manufacturer. Notify City in writing if such installation will not provide permanent, rigid installation in existing conditions.
  5. Install sign units and components at locations shown, securely mounted with concealed, theft-proof fasteners. No exposed fasteners for installation may be visible. Attach





- signs to substrates in accordance with manufacturer's instructions. Provide anchorage and fittings. Coordinate location in field with City.
6. Install level and plumb at proper height. Repair or replace damaged units. Coordinate and field measure proper location of signs, where required, with City.
  7. Coordinate with City all installation procedures and required scheduling, to avoid delays or additional costs.
  8. Coordinate sign locations with existing mechanical, electrical, plumbing and landscape elements and notify City in writing of any visual or physical conflicts.
  9. Protect all adjacent surfaces from damage during installation, promptly repair all such damage.
  10. Adjust and clean sign surfaces so they are free of residue and other foreign materials. Following installation, remove all traces of visible tapes, adhesives, wrappings and refuse from Site.

C. Wall Mounted Signs: Attach signs to wall surfaces using methods indicated below:

1. Adhesives: All adhesives in accordance with recommendations made by manufacturer of material to be laminated or adhered. All visible joints free from air bubbles and other defects.
2. Foam tapes: 1/16" thick.
3. Silicone Adhesive: Ready to use, high performance adhesive. General Electric GE 1200 sealant, translucent SCS 1201 or approved equal as recommended by manufacturer for bonding condition.
4. Adhesive Tape: Hi-Performance double-sided adhesive tape, 3M 467MP, or approved equal, used for laminating tactile magnesium inserts to acrylic substrate.
5. Mechanical Attachment: At all irregular surfaces.

### 3.3 CLEANING AND PROTECTION

- A. After installation, clean soiled sign surfaces according to manufacturer's instructions. Protect units from damage until acceptance by City.
- B. Maintenance Instructions: Provide written instructions to City for proper maintenance of all signs. Address periodic cleaning, painting (include all color specifications) where applicable, replacement procedures, etc., in operation and maintenance manuals.
- C. Provide written instructions for removal of signs from wall surfaces.

**END OF SECTION 10 14 00**



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## SECTION 10 26 00 - WALL AND DOOR PROTECTION

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Corner guards.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: Include construction details, material descriptions, impact strength, dimensions of individual components and profiles, and finishes for each impact-resistant wall protection unit.

#### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Source Limitations: Obtain impact-resistant wall protection units from single source from single manufacturer.
- C. Product Options: Drawings indicate size, profiles, and dimensional requirements of impact-resistant wall protection units and are based on the specific system indicated.
- D. Surface-Burning Characteristics: Provide impact-resistant, plastic wall protection units with surface-burning characteristics as determined by testing identical products per ASTM E 84, NFPA 255, or UL 723 by UL or another qualified testing agency.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store impact-resistant wall protection units in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
  - 1. Maintain room temperature within storage area at not less than 70 deg F during the period plastic materials are stored.
  - 2. Store plastic wall protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F.
    - a. Store corner-guard covers in a vertical position.
    - b. Store covers in a horizontal position.



1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install impact-resistant wall protection units until building is enclosed and weatherproof, wet work is complete and dry, and HVAC system is operating and maintaining temperature at 70 deg F for not less than 72 hours before beginning installation and for the remainder of the construction period.

**PART 2 - PRODUCTS**

2.1 MATERIALS

- A. Stainless-Steel Sheet: ASTM A 240/A 240M.
- B. Fasteners: Nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened.

2.2 CORNER GUARDS

- A. Surface-Mounted, Metal Corner Guards: Fabricated from one-piece, formed with formed edges; with 90- or 135-degree turn to match wall condition.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide Construction Specialties Model CO-8 or comparable product by one of the following:
    - a. Arden Architectural Specialties, Inc.
    - b. Construction Specialties, Inc.
    - c. IPC Door and Wall Protection Systems; Division of InPro Corporation.
    - d. Pawling Corporation.
  - 3. Material: Stainless steel, Type 304
    - a. Thickness: Minimum 0.0625 inch.
    - b. Finish: Directional satin, No. 4.
  - 4. Wing Size: Nominal 3-1/2 by 3-1/2 inches.
  - 5. Corner Radius: 1/8 inch.
  - 6. Mounting: adhered.

2.3 FABRICATION

- A. Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.
- B. Fabricate components with tight seams and joints with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

2.4 METAL FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
  - 1. Remove tool and die marks and stretch lines, or blend into finish.



2. Grind and polish surfaces to produce uniform finish, free of cross scratches.
  3. Run grain of directional finishes with long dimension of each piece.
  4. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
- B. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Examine walls to which impact-resistant wall protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.
  1. For impact-resistant wall protection units attached with adhesive or foam tape, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### **3.2 PREPARATION**

- A. Complete finishing operations, including painting, before installing impact-resistant wall protection system components.
- B. Before installation, clean substrate to remove dust, debris, and loose particles.

#### **3.3 INSTALLATION**

- A. General: Install impact-resistant wall protection units level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.

#### **3.4 CLEANING**

- A. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

**END OF SECTION 10 26 00**



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## SECTION 10 28 00 - TOILET, BATH, AND LAUNDRY ACCESSORIES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Public-use washroom accessories.
  - 2. Public-use shower room accessories.
  - 3. Private-use bathroom accessories.

#### 1.3 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
  - 2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
  - 3. Include electrical characteristics.
- B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
  - 1. Identify locations using room designations indicated.
  - 2. Identify accessories using designations indicated.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For accessories to include in maintenance manuals.

### PART 2 - PRODUCTS

#### 2.1 CITY-FURNISHED MATERIALS

- A. City-Furnished Contractor-Installed Materials: Soap dispenser.



**2.2 PERFORMANCE REQUIREMENTS**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

**2.3 PUBLIC-USE WASHROOM ACCESSORIES**

- A. Source Limitations: Obtain public-use washroom accessories from single source from single manufacturer.

- B. Toilet Tissue (Roll) Dispenser TPH:

- 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide Bobrick Washroom Equipment, Inc B-6977 or comparable product by one of the following:
  - a. American Specialties, Inc.; ASI Group.
  - b. Bradley Corporation.
- 3. Mounting: Semirecessed Surface mount.
- 4. Capacity: Designed for two standard diameter tissue rolls up to 6" diameter.

- C. Paper Towel (Folded) Dispenser PT:

- 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide Bobrick Washroom Equipment, Inc. B-2620 or comparable product by one of the following:
  - a. American Specialties, Inc.; ASI Group.
  - b. Bradley Corporation.
- 3. Mounting: Semirecessed Surface mount.
- 4. Minimum Capacity: 400 C-fold or 525 multifold towels.
- 5. Material and Finish: Stainless steel, No. 4 finish (satin).
- 6. Lockset: Tumbler type.
- 7. Refill Indicator: Pierced slots at sides or front.

- D. Combination Towel (Folded) Dispenser/Waste Receptacle PTD/WR:

- 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide Bobrick Washroom Equipment, Inc. B-3944 or comparable product by one of the following:
  - a. American Specialties, Inc.; ASI Group.
  - b. Bradley Corporation.
  - c. Brey-Krause Manufacturing Co.
- 3. Description: Combination unit for dispensing C-fold or multifold towels, with removable waste receptacle.
- 4. Mounting: Surface mounted.
  - a. Designed for nominal 4-inch wall depth.
- 5. Minimum Towel-Dispenser Capacity: 600 C-fold or 800 multifold paper towels.
- 6. Minimum Waste-Receptacle Capacity: 12 gal.
- 7. Material and Finish: Stainless steel, No. 4 finish (satin).





- E. Grab Bar GB-1, GB-2, GB-3, and GB-4:
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  2. Basis-of-Design Product: Subject to compliance with requirements, provide Bobrick Washroom Equipment, In. B-5806 Series or comparable product by one of the following:
    - a. American Specialties, Inc.; ASI Group.
    - b. Bradley Corporation.
  3. Mounting: Flanges with fasteners.
  4. Material: Stainless steel, 0.05 inch thick.
    - a. Finish: Smooth, No. 4 finish (satin) .
  5. Outside Diameter: 1-1/4 inches.
  6. Configuration and Length: Straight. GB-1 is 48 inches long, GB-2 and GB-3 is 36 inches long, and GB-4 is 18 inches long.
- F. Sanitary-Napkin Disposal Unit SND:
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  2. Basis-of-Design Product: Subject to compliance with requirements, provide Bobrick Washroom Equipment, Inc. B-270 or comparable product by one of the following:
    - a. Bradley Corporation.
    - b. GAMCO Specialty Accessories; a division of Bobrick.
  3. Mounting: Surface-mounted.
  4. Door or Cover: Self-closing, disposal-opening cover.
  5. Receptacle: Removable.
  6. Material and Finish: Stainless steel, No. 4 finish (satin).
- G. Mirror Unit MR:
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  2. Basis-of-Design Product: Subject to compliance with requirements, provide Bobrick Washroom Equipment, Inc. B-165 2436 or comparable product by one of the following:
    - a. American Specialties, Inc.; ASI Group.
    - b. Bradley Corporation.
  3. Frame: Stainless-steel channel.
    - a. Corners: Mitered and mechanically interlocked.
  4. Integral Shelf: 5 inches deep.
  5. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.
    - a. One-piece, galvanized-steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
    - b. Wall bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
  6. Size: 24 inches by 36 inches.
- H. Robe Hook RH:
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  2. Basis-of-Design Product: Subject to compliance with requirements, provide Bobrick Washroom Equipment, Inc. B-76727 or comparable product by one of the following:



- a. American Specialties, Inc.; ASI Group.
- b. Bradley Corporation.
- 3. Description: Double-prong unit.
- 4. Material and Finish: Stainless steel, No. 4 finish (satin).

2.4 PUBLIC-USE SHOWER ROOM ACCESSORIES

- A. Source Limitations: Obtain public-use shower room accessories from single source from single manufacturer.
  
- B. Shower Curtain Rod CR:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide Bobrick Washroom Equipment, Inc. B-207 x 60 or comparable product by one of the following:
    - a. American Specialties, Inc.; ASI Group.
    - b. Bradley Corporation.
    - c. Brey-Krause Manufacturing Co.
  - 3. Description: 1-inch OD; fabricated from nominal 0.05-inch- thick stainless steel.
  - 4. Mounting Flanges: Concealed mounting.
  - 5. Finish: Stainless steel, No. 4 finish (satin).
  
- C. Shower Curtain CR (Supply with curtain rod above):
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide Bobrick Washroom Equipment, Inc. 204-3 or comparable product by one of the following:
    - a. American Specialties, Inc.; ASI Group.
    - b. Bradley Corporation.
  - 3. Size: Minimum 12 inches wider than opening by 72 inches high.
  - 4. Material: Nylon-reinforced vinyl, minimum 10 oz. or 0.008-inch- thick vinyl, with integral antibacterial agent .
  - 5. Color: White.
  - 6. Grommets: Corrosion resistant at minimum 6 inches o.c. through top hem.
  - 7. Shower Curtain Hooks: Chrome-plated or stainless-steel, spring wire curtain hooks with snap fasteners, sized to accommodate specified curtain rod. Provide one hook per curtain grommet.
  
- D. Folding Shower Seat SS:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide Bobrick Washroom Equipment, Inc. B-5193 or comparable product by one of the following:
    - a. American Specialties, Inc.; ASI Group.
    - b. Bradley Corporation.
  - 3. Configuration: L-shaped seat, designed for wheelchair access.
  - 4. Seat: Phenolic or polymeric composite of slat-type or one-piece construction in color as selected by City.
  - 5. Mounting Mechanism: Stainless steel, No. 4 finish (satin).
  - 6. Dimensions: 33" inches by 20 15/16" inches.



E. Soap Dish SD:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide Bobrick Washroom Equipment, Inc. B4380 or comparable product by one of the following:
  - a. American Specialties, Inc.; ASI Group.
  - b. Bradley Corporation.
3. Description: Without washcloth bar.
4. Mounting: Recessed mounted.
5. Material and Finish: Stainless steel, No. 4 finish (satin).

2.5 PRIVATE-USE BATHROOM ACCESSORIES

A. Source Limitations: Obtain private-use bathroom accessories from single source from single manufacturer.

B. Medicine Cabinet MC:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide Bobrick Washroom Equipment, Inc. B-397 or comparable product by one of the following:
  - a. American Specialties, Inc.; ASI Group.
  - b. Franklin Brass by Liberty Hardware Manufacturing Corporation; a Masco company.
  - c. GAMCO Specialty Accessories; a division of Bobrick.
3. Mounting: Recessed, for nominal 4-inch wall depth.
4. Size: 16" x 26"
5. Door: Framed mirror door concealing storage cabinet equipped with continuous hinge and spring-buffered, rod-type stop and magnetic door catch.
6. Shelves: Three, adjustable.
7. Material and Finish:
  - a. Cabinet: Stainless steel, No. 4 finish (satin).
  - b. Mirror Frame: Stainless Steel, No. 4 Finish channel frame.
  - c. Door: Heavy-gauge steel.
  - d. Hinge: Enameled steel continuous piano hinge.
  - e. Shelves: Clear plastic extrusion.

C. Towel Bar TB:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide Bobrick Washroom Equipment, Inc. B-530 x 24 or comparable product by one of the following:
  - a. American Specialties, Inc.; ASI Group.
  - b. GAMCO Specialty Accessories; a division of Bobrick.
3. Description: 1-inch- round tube .
4. Mounting: Flanges with concealed fasteners.
5. Length: 24 inches.
6. Material and Finish: Stainless steel, No. 4 finish (satin).



- D. Toiletry Shelf TS:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide Bobrick Washroom Equipment, Inc. B-295 x16 or comparable product by one of the following:
    - a. American Specialties, Inc.; ASI Group.
    - b. Franklin Brass by Liberty Hardware Manufacturing Corporation; a Masco company.
    - c. GAMCO Specialty Accessories; a division of Bobrick.
  - 3. Description: Surface-mounted, shelf with two mounting
  - 4. Length: 18 inches.
  - 5. Material and Finish: Stainless steel, No. 4 finish (satin).

2.6 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.
- B. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.
- C. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- D. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- E. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.7 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

**PART 3 - EXECUTION**

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.



- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written instructions.

**END OF SECTION 10 28 00**



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## SECTION 10 28 19 - TUB AND SHOWER DOORS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section includes frameless shower doors and enclosures.

#### 1.3 FIELD CONDITIONS

- A. Verify dimensions by field measurements before fabrication and indicate on Shop Drawings.

### PART 2 - PRODUCTS

#### 2.1 FRAMELESS ENCLOSURES

- A. Frameless glass panels with mounting and operating hardware of types and sizes required to support imposed loads.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product C.L Lawrence Co. Geneva Series or comparable product by one of the following:
    - a. Agalite; Hartung Glass Industries.
    - b. Alumax; Sapa Extrusions, Inc.
    - c. Cardinal Shower Enclosures; Hoskin & Muir, Inc.
    - d. Southeastern Aluminum Products, Inc.
- B. Hardware and Trim: Manufacturer's standard units as indicated and as required for complete installation.
  - 1. Materials:
    - a. Brass:
      - 1) Finish: Satin chrome.
- C. Swinging Doors: Hinged for 90 degrees out swing. Self-centering when doors are within 15 degrees of closed position. Soft bulb seal or wipes; affixed to door to direct water back into enclosure and provide a tight water seal.
  - 1. Hinges: Side hinged.
  - 2. Door Pulls: Knobs.
- D. Fixed Panels: Top-and-bottom mounts; match hinges in material and finish.
- E. Glazing: Safety glazing materials complying with 16 CFR 1201, Category II, with permanently etched identification acceptable to authorities having jurisdiction.
  - 1. Glass Nominal Thickness: 10 mm.



2. Clear Glass: ASTM C 1048, Type I, Quality-Q3, Class I (clear), Kind FT.
  3. Protective, Self-Cleaning, Glass Coating: Clear float glass with a coating on first surface having both photocatalytic and hydrophilic properties that act to loosen dirt and to cause water to sheet evenly over the glass instead of beading.
- F. Fasteners: Manufacturer's standard stainless-steel or other noncorrosive fasteners.
- G. Sealant: Mildew-resistant, single-component, nonsag, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, for Use NT.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. Prepare and install as recommended in manufacturer's written instructions unless more stringent requirements are contained in GANA's "Glazing Manual."
- B. Clean substrates, removing projections, filling voids, and sealing joints.
- C. Set units level, plumb, and true to line, without warp or rack of frames and panels, and anchor securely in place.
- D. Fasten components securely in place, with provisions for thermal movement. Install with concealed fasteners unless otherwise indicated.
- E. Install components to drain and return water to tub or shower.
- F. Install doors to produce smooth operation and tight fit at contact points.
- G. Repair, refinish, or replace components damaged during installation.

#### **3.2 ADJUSTING AND CLEANING**

- A. Adjust operating parts and hardware for smooth, quiet operation and watertight closure. Lubricate hardware and moving parts.
- B. Remove nonpermanent labels, and clean surfaces immediately after installation.

**END OF SECTION 10 28 19**





## SECTION 12 36 16 - METAL COUNTERTOPS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section includes stainless-steel countertops and backsplashes. Existing stainless steel countertop with integral sink and marine edges is to be altered by cutting and extension as required to suit casework.

#### 1.3 DELIVERY, STORAGE, AND HANDLING

- A. Remove existing stainless steel countertops and retain for reuse. Protect surfaces for delivery to fabrication shop.
- B. Deliver metal countertops only after casework has been completed in installation areas.
- C. Keep finished surfaces covered with polyethylene film or other protective covering during handling and installation.

#### 1.4 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of construction to receive metal countertops by field measurements before fabrication.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304.
- B. Sealant for Countertops: Manufacturer's standard sealant of characteristics indicated below that complies with applicable requirements in Section 079200 "Joint Sealants."
  - 1. Mildew-Resistant Joint Sealant: Mildew resistant, single component, nonsag, neutral curing, silicone.
  - 2. Color: Silver.
  - 3. Sealant shall have a VOC content of 250 g/L or less.



2.2 STAINLESS-STEEL COUNTERTOPS

- A. Countertops: Fabricate from 0.062-inch- thick, stainless-steel sheet. Extend the existing countertop as required over the enlarged base cabinet area. Provide smooth, clean exposed tops and edges in uniform plane, free of defects. Provide front and end overhang over the base cabinets to match existing.
  - 1. Weld shop-made joints.
  - 2. Form the backsplash coved to and integral with top surface, with a 4 or 6-inch-high edge and 1/2-inch return flange to match existing.
  - 3. Provide raised (marine) edge around perimeter of tops containing sinks to match existing; alter the depth of the existing sinks as required for compliance with accessibility requirements per drawings.

2.3 STAINLESS-STEEL FINISH

- A. Grind and polish surfaces to produce uniform, directional satin finish matching No. 4 finish, with no evidence of welds and free of cross scratches. Run grain with long dimension of each piece. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces clean.

**PART 3 - EXECUTION**

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of metal countertops.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install metal countertops level, plumb, and true; shim as required, using concealed shims.
- B. Field Jointing: Where possible, make field jointing in the same manner as shop jointing; use fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.
- C. Secure tops to cabinets with Z- or L-type fasteners or equivalent; use two or more fasteners at each front, end, and back.
- D. Abut top and edge surfaces in one true plane, with internal supports placed to prevent deflection.
- E. Seal junctures of tops, splashes, and walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

3.3 CLEANING AND PROTECTION

- A. Repair or remove and replace defective work as directed on completion of installation.



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- B. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by City.
- C. Protection: Provide 6-mil plastic or other suitable water-resistant covering over the countertop surfaces. Tape to underside of countertop at a minimum of 48 inches o.c. Remove protection at Substantial Completion.

**END OF SECTION 12 36 16**



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**SECTION 12 36 61.16 - SOLID SURFACING COUNTERTOPS**

**PART 1 - GENERAL**

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
  - 1. Solid surface material countertops.
  - 2. Solid surface material backsplashes.
  - 3. Solid surface material end splashes.
  - 4. Solid surface material apron fronts.
  - 5. Solid surface material sinks.

1.3 FIELD CONDITIONS

- A. Field Measurements: Verify dimensions of countertops by field measurements before countertop fabrication is complete.

1.4 COORDINATION

- A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

**PART 2 - PRODUCTS**

2.1 SOLID SURFACE COUNTERTOP MATERIALS

- A. Solid Surface Material: Homogeneous-filled plastic resin complying with ICPA SS-1.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide Wilsonart 9113ML Meadow Melange or comparable product by one of the following:
    - a. Avonite Surfaces.
    - b. E. I. du Pont de Nemours and Company.
    - c. Formica Corporation.
    - d. LG Chemical, Ltd.
    - e. Samsung Chemical USA, Inc.

2.2 COUNTERTOP FABRICATION

- A. Fabricate countertops according to solid surface material manufacturer's written instructions and to the AWI/AWMAC/WI's "Architectural Woodwork Standards."
  - 1. Grade: Custom .





- B. Configuration:
  - 1. Front: Beveled .
  - 2. Backsplash: Straight, slightly eased at corner.
  - 3. End Splash: Matching backsplash.
- C. Countertops: 1/2-inch- thick, solid surface material.
- D. Backsplashes: 3/4-inch- thick, solid surface material.
- E. Fabricate tops with shop-applied edges and backsplashes unless otherwise indicated. Comply with solid surface material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
  - 1. Fabricate with loose backsplashes for field assembly.
  - 2. Install integral sink bowls in countertops in the shop.
- F. Joints: Fabricate countertops without joints.
- G. Cutouts and Holes:
  - 1. Counter-Mounted Plumbing Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.

### 2.3 INSTALLATION MATERIALS

- A. Adhesive: Product recommended by solid surface material manufacturer.
  - 1. Adhesives shall have a VOC content of 70 g/L or less.
  - 2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Sealant for Countertops: Comply with applicable requirements in Section 079200 "Joint Sealants."

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates to receive solid surface material countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Install countertops level to a tolerance of 1/8 inch in 8 feet, 1/4 inch maximum. Do not exceed 1/64-inch difference between planes of adjacent units.



- B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Predrill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- C. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.
- D. Secure countertops to subtops with adhesive according to solid surface material manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- E. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.
  - 1. Install metal splines in kerfs in countertop edges at joints. Fill kerfs with adhesive before inserting splines and remove excess immediately after adjoining units are drawn into position.
  - 2. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned and joints are of specified width.
- F. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.
- G. Install aprons to backing and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears. Fasten by screwing through backing. Predrill holes for screws as recommended by manufacturer.
- H. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.
  - 1. Seal edges of cutouts in particleboard subtops by saturating with varnish.
- I. Apply sealant to gaps at walls; comply with Section 079200 "Joint Sealants."

**END OF SECTION 12 36 61.16**



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**SECTION 13 90 00 – STEEL SOFFITS**

**PART 1 - GENERAL**

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

1.2 SUBMITTALS

- A. Submit copies of manufacturer's specifications, installation instructions, and product data.

1.3 JOB CONDITIONS

- A. Coordinate installation soffit/cover system with all other trades.

**PART 2 - PRODUCTS**

2.1 MATERIAL

- A. A factory-fabricated steel cover support system with concealed surface-mounted attachment clamps, in dimensions as shown on the drawings for concealment of Fire Sprinkler Systems, Piping, HVAC, Conduit, Wiring or Cable.

Approved sources:

JG Innovations, Inc.  
 121 E Burbank Ave  
 P.O. Box 8128  
 Janesville, WI 53547-8128  
 Phone #: 888-933-2248  
 Fax #: 608-314-8712

In-Ex Systems, Inc.  
 4473 Cavallon Way  
 Acworth, GA 30101  
 Phone #: 800-483-8201  
 Fax #: 678-766-8202

- B. Support/Attachment Devices

1. Spring steel shield clips of the size recommended by manufacturer, for securement of the cover. Clips shall be produced from 21 Gauge minimum zinc-plated spring steel and shall have a reverse curvature design such that the clips soundly secure the soffit from easy removal. Each clip must be demonstrated as being able to resist a force of 100 lbs. uplift at the free end. Test results shall be available upon request.



C. Soffit/Cover

1. The soffit/cover shall be smooth in appearance and shall be made of 24 Gauge A60/G90 galvanized steel, with a paint grip finish and factory painted of a color to be specified by the City's representative. The cover shall have a snap-lock interfacing with the clips such that once assembled, it is rendered virtually irremovable with the use of ordinary tools.
2. The soffit and related fittings shall be factory painted with Sherwin Williams epoxy polyester hybrid powder coating of a color to be specified by the City's representative. Matching touch-up paint shall be supplied to the City by the manufacturer.
3. Cover manufacturer shall be staffed with a licensed engineer having a minimum of five years experience with such systems.
4. The soffit/cover shall be sized in accordance with requirements to accommodate the specific application size as specified by the project documents, specifications and blue prints, provided to the cover manufacturer prior to bid date.
5. L-Shield soffit profile for sidewall installations and/or U-Shield soffit profile for sidewall and/or pendant installations respectively.
6. Cover joints shall be butt-joined with interlocking internal splice couplings and/or with male/female interlocking joints. External couplings will NOT be allowed.
7. Cover design shall include a roll-formed "groove" at the interfacing of the cover and the adjacent construction surface to facilitate the application of sealant/adhesive compounds and enhance the security of such compounds from dislodging.

D. Accessories

1. The system shall include tamper-resistant end caps, prefabricated corners, wall flanges, couplings, and other items, which may be necessary to complete the system, and shall be installed in accordance with manufacturer recommendations.
2. Spare Parts - The installing contractor shall supply the City with quantities of spare parts equal to a minimum of five percent (5%) of the total quantities of each soffit part utilized in this installation.

**PART 3 - EXECUTION**

3.1 INSTALLATION, GENERAL

- A. Installation of system shall be in strict accordance with approved shop drawings and manufacturer's printed instructions.
1. Select appropriate fasteners for the substrate encountered to adequately secure the pipe and cover system.



2. To insure that the cover is linear and snug-fitting when installed, it is imperative that its support devices are anchored squarely and firmly against the structural surface in a straight line.
3. All penetrations to the soffit/cover system must be field cut to prevent misalignment with intended protrusion. The exceptions to this are that access doors will be factory furnished and installed and perforations, if required, for ventilation purposes will be factory perforated.
4. Guidelines for installation of modular soffit/cover system shall be supplied by the manufacturer of said system and the installing contractor shall adhere to the manufacturer's guidelines.
5. All field cut ends and scratches shall be "touched up" (spray or brush) with a matching paint.
6. Manufacturer shall supply on-site installation instruction, upon installer's request, by a qualified installation instructor for a minimum of one day for the project start-up (1,500 lineal feet minimum.)
7. The completed installation shall be visibly searched for voids between the interfacing of the cover and construction surface. Voids shall be sealed with a color matching siliconized caulk or urethane caulk.

**END OF SECTION 13 90 00**



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## SECTION 22 05 17 - SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Sleeves.
  - 2. Sleeve-seal systems.
  - 3. Grout.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

### PART 2 - PRODUCTS

#### 2.1 SLEEVE-SEAL SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Advance Products & Systems, Inc.
  - 2. CALPICO, Inc.
  - 3. Metraflex Company (The).
- B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
  - 1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
  - 2. Pressure Plates: Carbon steel.
  - 3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

#### 2.2 GROUT

- A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.



**PART 3 - EXECUTION**

**3.1 SLEEVE INSTALLATION**

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
- B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.
  - 1. Sleeves are not required for core-drilled holes.
- C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
  - 1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
  - 2. Cut sleeves to length for mounting flush with both surfaces.
    - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.
  - 3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.
- D. Install sleeves for pipes passing through interior partitions.
  - 1. Cut sleeves to length for mounting flush with both surfaces.
  - 2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
  - 3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 079200 "Joint Sealants."
- E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

**3.2 SLEEVE-SEAL-SYSTEM INSTALLATION**

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.
- B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

**3.3 SLEEVE AND SLEEVE-SEAL SCHEDULE**

- A. Use sleeves and sleeve seals for the following piping-penetration applications:
  - 1. Concrete Slabs-on-Grade:
    - a. Piping Smaller Than NPS 6: Cast-iron wall sleeves with sleeve-seal system.
      - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.



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2. Concrete Slabs above Grade:
  - a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.
3. Interior Partitions:
  - a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.

**END OF SECTION 22 05 17**



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**SECTION 22 05 18 - ESCUTCHEONS FOR PLUMBING PIPING**

**PART 1 - GENERAL**

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

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

**PART 3 - EXECUTION**

3.1 INSTALLATION

- A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.
- B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of insulated piping and with OD that completely covers opening.

**END OF SECTION 22 05 18**



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## SECTION 22 05 29 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Metal pipe hangers and supports.
  - 2. Trapeze pipe hangers.
  - 3. Pipe stands.
  - 4. Pipe positioning systems.
  - 5. Equipment supports.

#### 1.3 DEFINITIONS

- A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following; include Product Data for components:
  - 1. Trapeze pipe hangers.
  - 2. Pipe stands.
  - 3. Equipment supports.

#### 1.5 QUALITY ASSURANCE

- A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

### PART 2 - PRODUCTS

#### 2.1 METAL PIPE HANGERS AND SUPPORTS

- A. Carbon-Steel Pipe Hangers and Supports:
  - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
  - 2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.



3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
  4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
  5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
- B. Stainless-Steel Pipe Hangers and Supports:
1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
  2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
  3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.
- 2.2 TRAPEZE PIPE HANGERS
- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.
- 2.3 PIPE STANDS
- A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.
- B. Compact Pipe Stand: One-piece plastic unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.
- 2.4 PIPE POSITIONING SYSTEMS
- A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.
- 2.5 EQUIPMENT SUPPORTS
- A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.
- 2.6 MISCELLANEOUS MATERIALS
- A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
1. Properties: Nonstaining, noncorrosive, and nongaseous.
  2. Design Mix: 5000-psi, 28-day compressive strength.



## PART 3 - EXECUTION

### 3.1 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
  - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
  - 2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
- C. Pipe Stand Installation:
  - 1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
- D. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.
- E. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- F. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- G. 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.
- H. Install lateral bracing with pipe hangers and supports to prevent swaying.
- I. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- J. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

### 3.2 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.



### 3.3 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

### 3.4 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

### 3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
  - 1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

### 3.6 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.



- E. Use carbon-steel metal trapeze pipe hangers and attachments for general service applications.
- F. Use and stainless-steel attachments for hostile environment applications.
- G. Use copper-plated pipe hangers and or stainless-steel attachments for copper piping and tubing.
- H. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- I. Use instead of building attachments where required in concrete construction.
- J. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

**END OF SECTION 22 05 29**



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## SECTION 22 05 48 - VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Restrained-spring isolators.
  - 2. Pipe-riser resilient supports.
  - 3. Spring hangers.
  - 4. Seismic-restraint accessories.

#### 1.3 DEFINITIONS

- A. CBC: California Building Code.
- B. ICC-ES: ICC-Evaluation Service.
- C. OSHPD: Office of Statewide Health Planning & Development (for the State of California).

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
  - 2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of vibration isolation device and seismic-restraint component required.
    - a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an agency acceptable to authorities having jurisdiction.
    - b. Annotate to indicate application of each product submitted and compliance with requirements.
  - 3. Interlocking Snubbers: Include ratings for horizontal, vertical, and combined loads.
- B. Shop Drawings:
  - 1. Detail fabrication and assembly of equipment bases. Detail fabrication including anchorages and attachments to structure and to supported equipment.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer and testing agency.
- B. Welding certificates.



1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7 and that is acceptable to authorities having jurisdiction.
- B. Comply with seismic-restraint requirements in the CBC unless requirements in this Section are more stringent.
- C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- D. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are unavailable, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

**PART 2 - PRODUCTS**

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic-Restraint Loading:
  - 1. Site Class as Defined in the CBC: B.
  - 2. Assigned Seismic Use Group or Building Category as Defined in the CBC: II.
    - a. Component Importance Factor: 1.5.
    - b. Component Response Modification Factor: 1.5.
    - c. Component Amplification Factor: 1.0.
  - 3. Design Spectral Response Acceleration at Short Periods (0.2 Second).
  - 4. Design Spectral Response Acceleration at 1.0-Second Period.
  - 5. Rated strengths, features, and applications shall be as defined in reports by an agency acceptable to authorities having jurisdiction.
    - a. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they are subjected.

2.2 RESTRAINED-SPRING ISOLATORS

- A. Freestanding, Laterally Stable, Open-Spring Isolators with Vertical-Limit Stop Restraint.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. California Dynamics Corporation.
    - b. Kinetics Noise Control, Inc.
    - c. Mason Industries, Inc.
  - 2. Housing: Steel housing with vertical-limit stops to prevent spring extension due to weight being removed.





- a. Base with holes for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.
- b. Top plate with threaded mounting holes.
- c. Internal leveling bolt that acts as blocking during installation.
- 3. Restraint: Limit stop as required for equipment and authorities having jurisdiction.
- 4. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
- 5. Minimum Additional Travel: 50 percent of the required deflection at rated load.
- 6. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
- 7. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

### 2.3 PIPE-RISER RESILIENT SUPPORT

- A. Description: All-directional, acoustical pipe anchor consisting of two steel tubes separated by a minimum 1/2-inch- thick neoprene .
  - 1. Vertical-Limit Stops: Steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions.
  - 2. Maximum Load Per Support: 500 psigon isolation material providing equal isolation in all directions.

### 2.4 SPRING HANGERS

- A. Combination Coil-Spring and Elastomeric-Insert Hanger with Spring and Insert in Compression.
  - 1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
  - 2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
  - 3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
  - 4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
  - 5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
  - 6. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
  - 7. Self-centering hanger-rod cap to ensure concentricity between hanger rod and support spring coil.

### 2.5 SEISMIC-RESTRAINT ACCESSORIES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - 1. Cooper B-Line, Inc.
  - 2. Kinetics Noise Control, Inc.
  - 3. Mason Industries, Inc.
- B. Hanger-Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.



## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and equipment to receive vibration isolation and seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 APPLICATIONS

- A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.
- B. Hanger-Rod Stiffeners: Install hanger-rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.
- C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength is adequate to carry present and future static and seismic loads within specified loading limits.

### 3.3 VIBRATION CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION

- A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete."
- B. Installation of vibration isolators must not cause any change of position of equipment, piping, or ductwork resulting in stresses or misalignment.
- C. Equipment Restraints:
  - 1. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
  - 2. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction that provides required submittals for component.
- D. Piping Restraints:
  - 1. Comply with requirements in MSS SP-127.
  - 2. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
  - 3. Brace a change of direction longer than 12 feet.
- E. Install cables so they do not bend across edges of adjacent equipment or building structure.
- F. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction that provides required submittals for component.



- G. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.
- H. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.
- I. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.
- J. Drilled-in Anchors:
  - 1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
  - 2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
  - 3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
  - 4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
  - 5. Set anchors to manufacturer's recommended torque, using a torque wrench.
  - 6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

### 3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

- A. Install flexible connections in piping where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment. Comply with requirements in Section 221116 "Domestic Water Piping" for piping flexible connections.

### 3.5 FIELD QUALITY CONTROL

- A. Tests and Inspections:
  - 1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
  - 2. Schedule test with the City, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days' advance notice.
  - 3. Obtain City's approval before transmitting test loads to structure. Provide temporary load-spreading members.
  - 4. Test at least four of each type and size of installed anchors and fasteners selected by City.
  - 5. Test to 90 percent of rated proof load of device.
  - 6. Measure isolator restraint clearance.



7. Measure isolator deflection.
  8. Verify snubber minimum clearances.
- B. Remove and replace malfunctioning units and retest as specified above.
- C. Prepare test and inspection reports.
- 3.6 ADJUSTING
- A. Adjust isolators after piping system is at operating weight.
- B. 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.

**END OF SECTION 22 05 48**



## SECTION 22 05 53 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Equipment labels.
  - 2. Pipe labels.
  - 3. Stencils.
  - 4. Valve tags.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.
- C. Valve numbering scheme.
- D. Valve Schedules: For each piping system to include in maintenance manuals.

### PART 2 - PRODUCTS

#### 2.1 EQUIPMENT LABELS

- A. Metal Labels for Equipment:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Brady Corporation.
    - b. Carlton Industries, LP.
    - c. Champion America.
  - 3. Material and Thickness: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
  - 4. Letter Color: White.
  - 5. Background Color: Black.
  - 6. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.



7. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
  8. Fasteners: Stainless-steel rivets.
  9. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- B. Plastic Labels for Equipment:
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Brady Corporation.
    - b. Carlton Industries, LP.
    - c. Champion America.
  3. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
  4. Letter Color: White.
  5. Background Color: Black.
  6. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
  7. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
  8. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
  9. Fasteners: Stainless-steel rivets.
  10. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.
- D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number, and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

## 2.2 PIPE LABELS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Brady Corporation.
  2. Carlton Industries, LP.
  3. Champion America.
- C. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.





- D. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- E. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.
  - 1. Flow-Direction Arrows: Integral with piping-system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
  - 2. Lettering Size: Size letters according to ASME A13.1 for piping.

### 2.3 STENCILS

- A. Stencils for Piping:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Brimar Industries, Inc.
    - b. Carlton Industries, LP.
    - c. Champion America.
  - 3. Lettering Size: Size letters according to ASME A13.1 for piping.
  - 4. Stencil Material: Aluminum.
  - 5. Stencil Paint: Exterior, gloss, acrylic enamel in colors complying with recommendations in ASME A13.1 unless otherwise indicated. Paint may be in pressurized spray-can form.
  - 6. Identification Paint: Exterior, acrylic enamel in colors according to ASME A13.1 unless otherwise indicated. Paint may be in pressurized spray-can form.

### 2.4 VALVE TAGS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - 1. Brady Corporation.
  - 2. Brimar Industries, Inc.
  - 3. Carlton Industries, LP.
- C. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.
  - 1. Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
  - 2. Fasteners: Brass wire-link chain.
- D. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
  - 1. Valve-tag schedule shall be included in operation and maintenance data.



## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

### 3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

### 3.3 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

### 3.4 PIPE LABEL INSTALLATION

- A. Piping Color Coding: Painting of piping is specified in Section 099123 "Interior Painting."
- B. Stenciled Pipe Label Option: Stenciled labels may be provided instead of manufactured pipe labels, at Installer's option. Install stenciled pipe labels, complying with ASME A13.1, with painted, color-coded bands or rectangles on each piping system.
  - 1. Identification Paint: Use for contrasting background.
  - 2. Stencil Paint: Use for pipe marking.
- C. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
  - 1. Near each valve and control device.
  - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
  - 3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
  - 4. At access doors, manholes, and similar access points that permit view of concealed piping.
  - 5. Near major equipment items and other points of origination and termination.
  - 6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
  - 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.
- D. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.
- E. Pipe Label Color Schedule:



1. Domestic Water Piping
  - a. Background: Safety green.
  - b. Letter Colors: White.
2. Sanitary Waste and Storm Drainage Piping:
  - a. Background Color: Safety black.
  - b. Letter Color: White.

### 3.5 VALVE-TAG INSTALLATION

- A. Install tags on valves and control devices in piping systems, except check valves, valves within factory-fabricated equipment units, shutoff valves, faucets, convenience and lawn-watering hose connections, and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.
- B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:
  1. Valve-Tag Size and Shape:
    - a. Cold Water: 1-1/2 inches, round.
    - b. Hot Water: 1-1/2 inches, round.
  2. Valve-Tag Colors:
    - a. Cold Water: Natural.
    - b. Hot Water: Natural.
  3. Letter Colors:
    - a. Cold Water: White.
    - b. Hot Water: White.

**END OF SECTION 22 05 53**



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## SECTION 22 11 16 - DOMESTIC WATER PIPING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Under-building-slab and aboveground domestic water pipes, tubes, and fittings inside buildings.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For transition fittings and dielectric fittings.

#### 1.4 FIELD CONDITIONS

- A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by the City or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:
  - 1. Notify City no fewer than five days in advance of proposed interruption of water service.
  - 2. Do not interrupt water service without City's written permission.

### PART 2 - PRODUCTS

#### 2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.
- B. Potable-water piping and components shall comply with NSF 14 and NSF 61 Annex G. Plastic piping components shall be marked with "NSF-pw."

#### 2.2 PVC PIPE AND FITTINGS

- A. PVC Socket Fittings: .
- B. PVC Schedule 80 Threaded Fittings: ASTM D 2464.

#### 2.3 PIPING JOINING MATERIALS

- A. Pipe-Flange Gasket Materials:
  - 1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.



2. Full-face or ring type unless otherwise indicated.
- B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
- C. Solder Filler Metals: ASTM B 32, lead-free alloys.
- D. Flux: ASTM B 813, water flushable.
- E. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.
- F. Plastic, Pipe-Flange Gaskets, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

#### 2.4 TRANSITION FITTINGS

- A. General Requirements:
  1. Same size as pipes to be joined.
  2. Pressure rating at least equal to pipes to be joined.
  3. End connections compatible with pipes to be joined.
- B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
- C. Sleeve-Type Transition Coupling: AWWA C219.
  1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Cascade Waterworks Manufacturing Co.
    - b. Smith-Blair, Inc.
    - c. Viking Johnson.
- D. Plastic-to-Metal Transition Fittings:
  1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Charlotte Pipe and Foundry Company.
    - b. Harvel Plastics, Inc.
    - c. Spears Manufacturing Company.
  3. Description:
    - a. CPVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions.
    - b. One end with threaded brass insert and one solvent-cement-socket or threaded end.
- E. Plastic-to-Metal Transition Unions:
  1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Colonial Engineering, Inc.



- b. NIBCO Inc.
- c. Spears Manufacturing Company.
- 3. Description:
  - a. CPVC four-part union.
  - b. Brass or stainless-steel threaded end.
  - c. Solvent-cement-joint or threaded plastic end.
  - d. Rubber O-ring.
  - e. Union nut.

2.5 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
- B. Dielectric Unions:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Capitol Manufacturing Company.
    - b. Watts; a Watts Water Technologies company.
    - c. Wilkins.
  - 3. Standard: ASSE 1079.
  - 4. Pressure Rating: 125 psig minimum at 180 deg F.
  - 5. End Connections: Solder-joint copper alloy and threaded ferrous.
- C. Dielectric Flanges:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Capitol Manufacturing Company.
    - b. Watts; a Watts Water Technologies company.
    - c. Wilkins.
  - 3. Standard: ASSE 1079.
  - 4. Factory-fabricated, bolted, companion-flange assembly.
  - 5. Pressure Rating: 125 psig minimum at 180 deg F.
  - 6. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.
- D. Dielectric Nipples:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Elster Perfection Corporation.
    - b. Grinnell Mechanical Products.
    - c. Victaulic Company.
  - 3. Standard: IAPMO PS 66.
  - 4. Electroplated steel nipple complying with ASTM F 1545.



5. Pressure Rating and Temperature: 300 psig at 225 deg F.
6. End Connections: Male threaded or grooved.
7. Lining: Inert and noncorrosive, propylene.

## PART 3 - EXECUTION

### 3.1 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Comply with requirements for drain valves and strainers in Section 221119 "Domestic Water Piping Specialties."
- C. Install domestic water piping level with 0.25 percent slope downward toward drain and plumb.
- D. Rough-in domestic water piping for water-meter installation according to utility company's requirements.
- E. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- F. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- G. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- H. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.
- I. Install piping to permit valve servicing.
- J. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.
- K. Install piping free of sags and bends.
- L. Install fittings for changes in direction and branch connections.
- M. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."





- N. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- O. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

### 3.2 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- C. Joint Construction for Grooved-End Copper Tubing: Make joints according to AWWA C606. Roll groove ends of tubes. Lubricate and install gasket over ends of tubes or tube and fitting. Install coupling housing sections over gasket with keys seated in tubing grooves. Install and tighten housing bolts.
- D. Joint Construction for Grooved-End, Ductile-Iron Piping: Make joints according to AWWA C606. Cut round-bottom grooves in ends of pipe at gasket-seat dimension required for specified (flexible or rigid) joint. Lubricate and install gasket over ends of pipes or pipe and fitting. Install coupling housing sections over gasket with keys seated in piping grooves. Install and tighten housing bolts.
- E. Joint Construction for Grooved-End Steel Piping: Make joints according to AWWA C606. Roll groove ends of pipe as specified. Lubricate and install gasket over ends of pipes or pipe and fitting. Install coupling housing sections over gasket with keys seated in piping grooves. Install and tighten housing bolts.
- F. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.
- G. Joint Construction for Solvent-Cemented Plastic Piping: Clean and dry joining surfaces. Join pipe and fittings according to the following:
  - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements. Apply primer.
- H. Joints for PEX Piping: Join according to ASTM F 1807.
- I. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

### 3.3 TRANSITION FITTING INSTALLATION

- A. Install transition couplings at joints of dissimilar piping.
- B. Transition Fittings in Underground Domestic Water Piping:
  - 1. Fittings for NPS 1-1/2 and Smaller: Fitting-type coupling.



- 2. Fittings for NPS 2 and Larger: Sleeve-type coupling.
- C. Transition Fittings in Aboveground Domestic Water Piping NPS 2 and Smaller: Plastic-to-metal transition fittings unions.
- 3.4 DIELECTRIC FITTING INSTALLATION
  - A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
  - B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric couplings or nipples nipples unions.
  - C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges nipples.
- 3.5 HANGER AND SUPPORT INSTALLATION
  - A. Comply with requirements for seismic-restraint devices in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
  - B. Comply with requirements for pipe hanger, support products, and installation in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
    - 1. Vertical Piping: MSS Type 8 or 42, clamps.
    - 2. Individual, Straight, Horizontal Piping Runs:
      - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
      - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
      - c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
    - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
    - 4. Base of Vertical Piping: MSS Type 52, spring hangers.
  - C. Support vertical piping and tubing at base and at each floor.
  - D. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.
  - E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
    - 1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
    - 2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
    - 3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
    - 4. NPS 2-1/2: 108 inches with 1/2-inch rod.
    - 5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.
    - 6. NPS 6: 10 feet with 5/8-inch rod.
    - 7. NPS 8: 10 feet with 3/4-inch rod.
  - F. Install supports for vertical copper tubing every 10 feet.
  - G. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:
    - 1. NPS 1-1/4 and Smaller: 84 inches with 3/8-inch rod.
    - 2. NPS 1-1/2: 108 inches with 3/8-inch rod.
    - 3. NPS 2: 10 feet with 3/8-inch rod.
    - 4. NPS 2-1/2: 11 feet with 1/2-inch rod.



5. NPS 3 and NPS 3-1/2: 12 feet with 1/2-inch rod.
  6. NPS 4 and NPS 5: 12 feet with 5/8-inch rod.
  7. NPS 6: 12 feet with 3/4-inch rod.
  8. NPS 8 to NPS 12: 12 feet with 7/8-inch rod.
- H. Install hangers for stainless-steel piping with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1-1/4 and Smaller: 84 inches with 3/8-inch rod.
  2. NPS 1-1/2: 108 inches with 3/8-inch rod.
  3. NPS 2: 10 feet with 3/8-inch rod.
  4. NPS 3 and NPS 3-1/2: 12 feet with 1/2-inch rod.
  5. NPS 4 and NPS 5: 12 feet with 5/8-inch rod.
  6. NPS 6: 12 feet with 3/4-inch rod.
  7. NPS 8 to NPS 12: 12 feet with 7/8-inch rod.
- I. Install supports for vertical stainless-steel piping every 15 feet.
- J. Install vinyl-coated hangers for CPVC piping with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1 and Smaller: 36 inches with 3/8-inch rod.
  2. NPS 1-1/4 to NPS 2: 48 inches with 3/8-inch rod.
  3. NPS 2-1/2 to NPS 3-1/2: 48 inches with 1/2-inch rod.
  4. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.
  5. NPS 6: 48 inches with 3/4-inch rod.
  6. NPS 8: 48 inches with 7/8-inch rod.
- K. Install supports for vertical CPVC piping every 60 inches for NPS 1 and smaller, and every 72 inches for NPS 1-1/4 and larger.
- L. Install vinyl-coated hangers for PEX piping with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1 and Smaller: 32 inches with 3/8-inch rod.
- M. Install hangers for vertical PEX piping every 48 inches.
- N. Install vinyl-coated hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 2 and Smaller: 48 inches with 3/8-inch rod.
  2. NPS 2-1/2 to NPS 3-1/2: 48 inches with 1/2-inch rod.
  3. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.
  4. NPS 6: 48 inches with 3/4-inch rod.
  5. NPS 8: 48 inches with 7/8-inch rod.
- O. Install supports for vertical PP piping every 60 inches for NPS 1 and smaller, and every 72 inches for NPS 1-1/4 and larger.
- P. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.



### 3.6 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.
- C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

### 3.7 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification materials and installation in Section 220553 "Identification for Plumbing Piping and Equipment."
- B. Label pressure piping with system operating pressure.

### 3.8 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
  - 1. Piping Inspections:
    - a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
    - b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
      - 1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
      - 2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.
    - c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
    - d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
  - 2. Piping Tests:
    - a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
    - b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
    - c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
    - d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
    - e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
    - f. Prepare reports for tests and for corrective action required.



- B. Domestic water piping will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

### 3.9 ADJUSTING

- A. Perform the following adjustments before operation:
  - 1. Close drain valves, hydrants, and hose bibbs.
  - 2. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
  - 3. Remove and clean strainer screens. Close drain valves and replace drain plugs.
  - 4. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
  - 5. Check plumbing specialties and verify proper settings, adjustments, and operation.

### 3.10 CLEANING

- A. Clean and disinfect potable domestic water piping as follows:
  - 1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
  - 2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
    - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    - b. Fill and isolate system according to either of the following:
      - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
      - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
    - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
    - d. Repeat procedures if biological examination shows contamination.
    - e. Submit water samples in sterile bottles to authorities having jurisdiction.
- B. Clean non-potable domestic water piping as follows:
  - 1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
  - 2. Use purging procedures prescribed by authorities having jurisdiction or; if methods are not prescribed, follow procedures described below:
    - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    - b. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.
- C. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.
- D. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.



3.11 PIPING SCHEDULE

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
- B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.
- C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.

**END OF SECTION 22 11 16**



## SECTION 22 11 19 - DOMESTIC WATER PIPING SPECIALTIES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Vacuum breakers.
  - 2. Backflow preventers.
  - 3. Balancing valves.
  - 4. Temperature-actuated, water mixing valves.
  - 5. Water-hammer arresters.
  - 6. Air vents.
  - 7. Trap-seal primer valves.
  - 8. Flexible connectors.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For domestic water piping specialties.
  - 1. Include diagrams for power, signal, and control wiring.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

### PART 2 - PRODUCTS

#### 2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

- A. Potable-water piping and components shall comply with NSF 61 Annex G and NSF 14.

#### 2.2 PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.



2.3 VACUUM BREAKERS

- A. Pipe-Applied, Atmospheric-Type Vacuum Breakers :
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Cash Acme.
    - b. Watts; a Watts Water Technologies company.
    - c. Zurn Industries, LLC.
  - 3. Standard: ASSE 1001.
  - 4. Size: NPS 1/4 to NPS 3, as required to match connected piping.
  - 5. Body: Bronze.
  - 6. Inlet and Outlet Connections: Threaded.
  - 7. Finish: Rough bronze.

2.4 BACKFLOW PREVENTERS

- A. Reduced-Pressure-Principle Backflow Preventers :
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Conbraco Industries, Inc.
    - b. Watts; a Watts Water Technologies company.
    - c. Zurn Industries, LLC.
  - 3. Standard: ASSE 1013.
  - 4. Operation: Continuous-pressure applications.
  - 5. Pressure Loss: 12 psig maximum, through middle third of flow range.
  - 6. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved for NPS 2-1/2 and larger.
  - 7. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
  - 8. Configuration: Designed for horizontal, straight-through flow.
  - 9. Accessories:
    - a. Valves NPS 2 and Smaller: Ball type with threaded ends on inlet and outlet.
    - b. Valves NPS 2-1/2 and Larger: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.
    - c. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

2.5 BALANCING VALVES

- A. Copper-Alloy Calibrated Balancing Valves :
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. ITT Corporation.
    - b. NIBCO Inc.
    - c. Watts; a Watts Water Technologies company.
  - 3. Type: Ball valve with two readout ports and memory-setting indicator.





- 4. Body: Brass.
  - 5. Size: Same as connected piping, but not larger than NPS 2.
  - 6. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.
- B. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.
- 2.6 TEMPERATURE-ACTUATED, WATER MIXING VALVES

- A. Water-Temperature Limiting Devices:
- 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Armstrong International, Inc.
    - b. Watts; a Watts Water Technologies company.
    - c. Zurn Industries, LLC.
  - 3. Standard: ASSE 1017.
  - 4. Pressure Rating: 125 psig.
  - 5. Type: Thermostatically controlled, water mixing valve.
  - 6. Material: Bronze body with corrosion-resistant interior components.
  - 7. Connections: Threaded inlets and outlet.
  - 8. Accessories: Check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
  - 9. Valve Finish: Chrome plated.

2.7 WATER-HAMMER ARRESTERS

- A. Water-Hammer Arresters <Insert drawing designation if any>:
- 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. AMTROL, Inc.
    - b. Watts; a Watts Water Technologies company.
    - c. Zurn Industries, LLC.
  - 3. Standard: ASSE 1010 or PDI-WH 201.
  - 4. Type: Metal bellows.
  - 5. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

2.8 AIR VENTS

- A. Bolted-Construction Automatic Air Vents :
- 1. Body: Bronze.
  - 2. Pressure Rating and Temperature: 125-psig minimum pressure rating at 140 deg F.
  - 3. Float: Replaceable, corrosion-resistant metal.
  - 4. Mechanism and Seat: Stainless steel.
  - 5. Size: NPS 3/8 minimum inlet.
  - 6. Inlet and Vent Outlet End Connections: Threaded.



## 2.9 TRAP-SEAL PRIMER DEVICE

- A. Supply-Type, Trap-Seal Primer Device :
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  2. Standard: ASSE 1018.
  3. Pressure Rating: 125 psig minimum.
  4. Body: Bronze.
  5. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
  6. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
  7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

## 2.10 FLEXIBLE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Flexicraft Industries.
  2. Hyspan Precision Products, Inc.
  3. Metraflex Company (The).

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.
1. Locate backflow preventers in same room as connected equipment or system.
  2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe-to-floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are unacceptable for this application.
  3. Do not install bypass piping around backflow preventers.
- B. Install balancing valves in locations where they can easily be adjusted.
- C. Install temperature-actuated, water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.
1. Install cabinet-type units recessed in or surface mounted on wall as specified.
- D. Install water-hammer arresters in water piping according to PDI-WH 201.
- E. Install air vents at high points of water piping.



- F. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

### 3.2 CONNECTIONS

- A. Comply with requirements for ground equipment in Section 260526 "Grounding and Bonding for Electrical Systems."
- B. Fire-retardant-treated-wood blocking is specified in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for electrical connections.

### 3.3 LABELING AND IDENTIFYING

- A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:
  - 1. Reduced-pressure-principle backflow preventers.
  - 2. Calibrated balancing valves.
  - 3. Supply-type, trap-seal primer valves.
- B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Section 220553 "Identification for Plumbing Piping and Equipment."

### 3.4 ADJUSTING

- A. Set field-adjustable pressure set points of water pressure-reducing valves.
- B. Set field-adjustable flow set points of balancing valves.
- C. Set field-adjustable temperature set points of temperature-actuated, water mixing valves.

**END OF SECTION 22 11 19**



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## SECTION 22 13 16 - SANITARY WASTE AND VENT PIPING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Pipe, tube, and fittings.
  - 2. Specialty pipe fittings.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:
  - 1. Soil, Waste, and Vent Piping: 10-foot head of water.
- B. Seismic Performance: Soil, waste, and vent piping and support and installation shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For sovent drainage system. Include plans, elevations, sections, and details.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Certificates: For waste and vent piping, accessories, and components, from manufacturer.
  - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  - 2. Detailed description of piping anchorage devices on which the certification is based and their installation requirements.

#### 1.6 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF/ANSI 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.



1.7 PROJECT CONDITIONS

- A. Interruption of Existing Sanitary Waste Service: Do not interrupt service to facilities occupied by the City or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
  - 1. Notify Architect no fewer than two days in advance of proposed interruption of sanitary waste service.
  - 2. Do not proceed with interruption of sanitary waste service without Architect's written permission.

**PART 2 - PRODUCTS**

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 74, Service class(es).
- B. Gaskets: ASTM C 564, rubber.

2.3 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 888 or CISPI 301.
- B. CISPI, Hubless-Piping Couplings:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Matco-Norca, Inc.
    - b. MIFAB, Inc.
    - c. Mission Rubber Company; a division of MCP Industries, Inc.
  - 2. Standards: ASTM C 1277 and CISPI 310.
  - 3. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.4 SPECIALTY PIPE FITTINGS

- A. Dielectric Fittings:
  - 1. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
  - 2. Dielectric Unions:
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) Capitol Manufacturing Company.
      - 2) Watts Regulator Co.; a division of Watts Water Technologies, Inc.
      - 3) Wilkins; a Zurn company.
    - b. Description:





- 1) Standard: ASSE 1079.
- 2) Pressure Rating: 125 psig minimum at 180 deg F.
- 3) End Connections: Solder-joint copper alloy and threaded ferrous.

## PART 3 - EXECUTION

### 3.1 EARTH MOVING

- A. Comply with requirements for excavating, trenching, and backfilling specified in Section 312000 "Earth Moving."

### 3.2 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation.
- J. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- K. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.



- L. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- M. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:
  - 1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
  - 2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
  - 3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
- N. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
- O. Install engineered soil and waste drainage and vent piping systems as follows:
  - 1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.
  - 2. Solvent Drainage System: Comply with ASSE 1043 and solvent fitting manufacturer's written installation instructions.
  - 3. Reduced-Size Venting: Comply with standards of authorities having jurisdiction.
- P. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- Q. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- R. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- S. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

**3.3 JOINT CONSTRUCTION**

- A. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
- B. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.
- C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
  - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.





2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

- D. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.

### 3.4 SPECIALTY PIPE FITTING INSTALLATION

#### A. Transition Couplings:

1. Install transition couplings at joints of piping with small differences in OD's.

#### B. Dielectric Fittings:

1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
2. Dielectric Fittings for NPS 2 and Smaller: Use dielectric unions.
3. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric nipples.

### 3.5 CONNECTIONS

#### A. Drawings indicate general arrangement of piping, fittings, and specialties.

#### B. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

#### C. Make connections according to the following unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

### 3.6 IDENTIFICATION

#### A. Identify exposed sanitary waste and vent piping. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

### 3.7 PIPING SCHEDULE

#### A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.

#### B. Aboveground, soil and waste piping NPS 4 and smaller shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
3. ABS pipe, ABS socket fittings, and solvent-cemented joints.
4. PVC pipe, PVC socket fittings, and solvent-cemented joints.

#### C. Aboveground, vent piping NPS 4 and smaller shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
3. ABS pipe, ABS socket fittings, and solvent-cemented joints.



- D. Aboveground, vent piping NPS 5 and larger shall be any of the following:
1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
  2. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
  3. PVC pipe, PVC socket fittings, and solvent-cemented joints.

**END OF SECTION 22 13 16**



## SECTION 22 34 00 - FUEL-FIRED, DOMESTIC-WATER HEATERS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Commercial, gas-fired, high-efficiency, storage, domestic-water heaters.
  - 2. Domestic-water heater accessories.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Commercial domestic-water heaters shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
  - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type and size of domestic-water heater indicated.
- B. Shop Drawings:
  - 1. Wiring Diagrams: For power, signal, and control wiring.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Certificates: For fuel-fired, domestic-water heaters, accessories, and components, from manufacturer.
  - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
  - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- B. Product Certificates: For each type of commercial, gas-fired, domestic-water heater, from manufacturer.
- C. Domestic-Water Heater Labeling: Certified and labeled by testing agency acceptable to authorities having jurisdiction.



1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fuel-fired, domestic-water heaters to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

- A. ASME Compliance:
  - 1. Where ASME-code construction is indicated, fabricate and label commercial, domestic-water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
  - 2. Where ASME-code construction is indicated, fabricate and label commercial, finned-tube, domestic-water heaters to comply with ASME Boiler and Pressure Vessel Code: Section IV.

1.8 COORDINATION

- A. Coordinate sizes and locations of concrete bases with actual equipment provided.

**PART 2 - PRODUCTS**

2.1 COMMERCIAL, GAS-FIRED, STORAGE, DOMESTIC-WATER HEATERS

- A. Commercial, Gas-Fired, High-Efficiency, Storage, Domestic-Water Heaters:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. American Water Heaters.
    - b. Bradford White Corporation.
    - c. Rheem Manufacturing Company.
    - d. State Industries.
  - 3. Standard: ANSI Z21.10.3/CSA 4.3.
  - 4. Description: Manufacturer's proprietary design to provide at least 85 percent combustion efficiency at optimum operating conditions.
  - 5. Factory-Installed Storage-Tank Appurtenances:
    - a. Anode Rod: Replaceable magnesium.
    - b. Dip Tube: Required unless cold-water inlet is near bottom of tank.
    - c. Drain Valve: Corrosion-resistant metal complying with ASSE 1005.
    - d. Insulation: Comply with ASHRAE/IESNA 90.1. Surround entire storage tank except connections and controls.
    - e. Jacket: Steel with enameled finish.
    - f. Burner or Heat Exchanger: Comply with UL 795 or approved testing agency requirements for gas-fired, high-efficiency, domestic-water heaters and natural-gas fuel.
    - g. Temperature Control: Adjustable thermostat.
    - h. Safety Controls: Automatic, high-temperature-limit and low-water cutoff devices or systems.



- i. Combination Temperature-and-Pressure Relief Valves: ANSI Z21.22/CSA 4.4-M. Include one or more relief valves with total relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select one relief valve with sensing element that extends into storage tank.
- 6. Draft Hood: Draft diverter, complying with ANSI Z21.12.

2.2 DOMESTIC-WATER HEATER ACCESSORIES

- A. Drain Pans: Corrosion-resistant metal with raised edge. Comply with ANSI/CSA LC 3. Include dimensions not less than base of domestic-water heater, and include drain outlet not less than NPS 3/4 with ASME B1.20.1 pipe threads or with ASME B1.20.7 garden-hose threads.
- B. Manifold Kits: Domestic-water heater manufacturer's factory-fabricated inlet and outlet piping for field installation, for multiple domestic-water heater installation. Include ball-, butterfly-, or gate-type shutoff valves to isolate each domestic-water heater and memory-stop balancing valves to provide balanced flow through each domestic-water heater.
- C. Gas Shutoff Valves: ANSI Z21.15/CSA 9.1-M, manually operated. Furnish for installation in piping.
- D. Gas Pressure Regulators: ANSI Z21.18/CSA 6.3, appliance type. Include 5-psig pressure rating as required to match gas supply.
- E. Automatic Gas Valves: ANSI Z21.21/CSA 6.5, appliance, electrically operated, on-off automatic valve.
- F. Combination Temperature-and-Pressure Relief Valves: Include relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select relief valves with sensing element that extends into storage tank.
  - 1. Gas-Fired, Domestic-Water Heaters: ANSI Z21.22/CSA 4.4-M.
  - 2. Oil-Fired, Domestic-Water Heaters: ASME rated and stamped.
- G. Pressure Relief Valves: Include pressure setting less than domestic-water heater working-pressure rating.
  - 1. Gas-Fired, Domestic-Water Heaters: ANSI Z21.22/CSA 4.4-M.
  - 2. Oil-Fired, Domestic-Water Heaters: ASME rated and stamped.
- H. Vacuum Relief Valves: ANSI Z21.22/CSA 4.4-M.
- I. Domestic-Water Heater Stands: Manufacturer's factory-fabricated steel stand for floor mounting, capable of supporting domestic-water heater and water. Provide dimension that will support bottom of domestic-water heater a minimum of 18 inches above the floor.
- J. Domestic-Water Heater Mounting Brackets: Manufacturer's factory-fabricated steel bracket for wall mounting, capable of supporting domestic-water heater and water.



## 2.3 SOURCE QUALITY CONTROL

- A. Factory Tests: Test and inspect assembled domestic-water heaters specified to be ASME-code construction, according to ASME Boiler and Pressure Vessel Code.
- B. Hydrostatically test domestic-water heaters to minimum of one and one-half times pressure rating before shipment.
- C. Prepare test and inspection reports.

## PART 3 - EXECUTION

### 3.1 DOMESTIC-WATER HEATER INSTALLATION

- A. Commercial, Domestic-Water Heater Mounting: Install commercial domestic-water heaters on concrete base. Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete."
  - 1. Exception: Omit concrete bases for commercial domestic-water heaters if installation on stand, bracket, suspended platform, or directly on floor is indicated.
  - 2. Maintain manufacturer's recommended clearances.
  - 3. Arrange units so controls and devices that require servicing are accessible.
  - 4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
  - 5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
  - 6. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 7. Install anchor bolts to elevations required for proper attachment to supported equipment.
  - 8. Anchor domestic-water heaters to substrate.
- B. Install domestic-water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.
  - 1. Install shutoff valves on domestic-water-supply piping to domestic-water heaters and on domestic-hot-water outlet piping.
- C. Install gas-fired, domestic-water heaters according to NFPA 54.
  - 1. Install gas shutoff valves on gas supply piping to gas-fired, domestic-water heaters without shutoff valves.
  - 2. Install gas pressure regulators on gas supplies to gas-fired, domestic-water heaters without gas pressure regulators if gas pressure regulators are required to reduce gas pressure at burner.
  - 3. Install automatic gas valves on gas supplies to gas-fired, domestic-water heaters if required for operation of safety control.
- D. Install commercial domestic-water heaters with seismic-restraint devices. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."



- E. Install combination temperature-and-pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.
- F. Install combination temperature-and-pressure relief valves in water piping for domestic-water heaters without storage. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.
- G. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for domestic-water heaters that do not have tank drains. Comply with requirements for hose-end drain valves specified in Section 221119 "Domestic Water Piping Specialties."
- H. Assemble and install inlet and outlet piping manifold kits for multiple domestic-water heaters. Fabricate, modify, or arrange manifolds for balanced water flow through each domestic-water heater. Include shutoff valve and thermometer in each domestic-water heater inlet and outlet, and throttling valve in each domestic-water heater outlet.
- I. Fill domestic-water heaters with water.
- J. Charge domestic-water compression tanks with air.

### 3.2 CONNECTIONS

- A. Comply with requirements for domestic-water piping specified in Section 221116 "Domestic Water Piping."
- B. Drawings indicate general arrangement of piping, fittings, and specialties.
- C. Where installing piping adjacent to fuel-fired, domestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.

### 3.3 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

### 3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
  - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
  - 2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
  - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.



4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
  - B. Domestic-water heaters will be considered defective if they do not pass tests and inspections.
  - C. Prepare test and inspection reports.
- 3.5 DEMONSTRATION
  - A. Engage a factory-authorized service representative to train City's maintenance personnel to adjust, operate, and maintain commercial, gas-fired, storage, domestic-water heaters.

**END OF SECTION 22 34 00**





## SECTION 22 42 13.13 - COMMERCIAL WATER CLOSETS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Water closets.
  - 2. Flushometer valves.
  - 3. Toilet seats.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for water closets.
  - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings: Include diagrams for power, signal, and control wiring.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For flushometer valves and electronic sensors to include in operation and maintenance manuals.

#### 1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Flushometer-Valve Repair Kits: Equal to 10 percent of amount of each type installed, but no fewer than one of each type.

### PART 2 - PRODUCTS

#### 2.1 FLOOR-MOUNTED, BOTTOM-OUTLET WATER CLOSETS

- A. Water Closets : Floor mounted, bottom outlet, top spud.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. American Standard America.
    - b. Crane Plumbing, L.L.C.
    - c. Kohler Co.



- 2. Bowl:
  - a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
  - b. Material: Vitreous china.
  - c. Type: Siphon jet.
  - d. Style: Flushometer valve.
  - e. Height: Standard Handicapped/elderly, complying with ICC/ANSI A117.1.
  - f. Rim Contour: Elongated.
  - g. Rim Height: 15”.
  - h. Water Consumption: 1.28 gal. per flush.
  - i. Spud Size and Location: NPS 1-1/2; top.
  - j. Color: White.
- 3. Bowl-to-Drain Connecting Fitting: ASTM A 1045 or ASME A112.4.3.

2.2 FLOOR-MOUNTED, BOTTOM-OUTLET WATER CLOSETS (ADA)

- A. Water Closets : Floor mounted, bottom outlet, top spud.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. American Standard America.
    - b. Crane Plumbing, L.L.C.
    - c. Kohler Co.
  - 2. Bowl:
    - a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
    - b. Material: Vitreous china.
    - c. Type: Siphon jet.
    - d. Style: Flushometer valve.
    - e. Height: Standard Handicapped/elderly, complying with ICC/ANSI A117.1.
    - f. Rim Contour: Elongated
    - g. Rim Height: 16-1/2”.
    - h. Water Consumption: 1.28 gal. per flush.
    - i. Spud Size and Location: NPS 1-1/2; top.
    - j. Color: White.
  - 3. Bowl-to-Drain Connecting Fitting: ASTM A 1045 or ASME A112.4.3.

2.3 FLUSHOMETER VALVES

- A. Lever-Handle, Diaphragm Flushometer Valves :
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. Sloan Valve Company.
    - b. Zurn Industries, LLC; Commercial Brass and Fixtures.
  - 2. Standard: ASSE 1037.
  - 3. Minimum Pressure Rating: 125 psig.
  - 4. Features: Include integral check stop and backflow-prevention device.
  - 5. Material: Brass body with corrosion-resistant components.
  - 6. Exposed Flushometer-Valve Finish: Chrome plated.
  - 7. Panel Finish: Chrome plated or stainless steel.
  - 8. Style: Exposed.
  - 9. Consumption: 1.28 gal. per flush.
  - 10. Minimum Inlet: NPS 1.
  - 11. Minimum Outlet: NPS 1-1/4.





## 2.4 TOILET SEATS

### A. Toilet Seats :

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - a. American Standard America.
  - b. Kohler Co.
  - c. TOTO USA, INC.
2. Standard: IAPMO/ANSI Z124.5.
3. Material: Plastic.
4. Type: Commercial (Standard).
5. Shape: Elongated rim, open front.
6. Hinge: Check.
7. Hinge Material: Noncorroding metal.
8. Seat Cover: Required.
9. Color: White.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before water-closet installation.
- B. Examine walls and floors for suitable conditions where water closets will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

#### A. Water-Closet Installation:

1. Install level and plumb according to roughing-in drawings.
2. Install floor-mounted water closets on bowl-to-drain connecting fitting attachments to piping or building substrate.
3. Install accessible, wall-mounted water closets at mounting height for handicapped/elderly, according to ICC/ANSI A117.1.

#### B. Support Installation:

1. Install supports, affixed to building substrate, for floor-mounted, back-outlet water closets.
2. Use carrier supports with waste-fitting assembly and seal.
3. Install floor-mounted, back-outlet water closets attached to building floor substrate, onto waste-fitting seals; and attach to support.
4. Install wall-mounted, back-outlet water-closet supports with waste-fitting assembly and waste-fitting seals; and affix to building substrate.

#### C. Flushometer-Valve Installation:

1. Install flushometer-valve, water-supply fitting on each supply to each water closet.
2. Attach supply piping to supports or substrate within pipe spaces behind fixtures.



3. Install lever-handle flushometer valves for accessible water closets with handle mounted on open side of water closet.
  4. Install actuators in locations that are easy for people with disabilities to reach.
  5. Install fresh batteries in battery-powered, electronic-sensor mechanisms.
- D. Install toilet seats on water closets.
- E. Wall Flange and Escutcheon Installation:
1. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations and within cabinets and millwork.
  2. Install deep-pattern escutcheons if required to conceal protruding fittings.
  3. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."
- F. Joint Sealing:
1. Seal joints between water closets and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant.
  2. Match sealant color to water-closet color.
  3. Comply with sealant requirements specified in Section 079200 "Joint Sealants."
- 3.3 CONNECTIONS
- A. Connect water closets with water supplies and soil, waste, and vent piping. Use size fittings required to match water closets.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."
- C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."
- D. Where installing piping adjacent to water closets, allow space for service and maintenance.
- 3.4 ADJUSTING
- A. Operate and adjust water closets and controls. Replace damaged and malfunctioning water closets, fittings, and controls.
- B. Adjust water pressure at flushometer valves to produce proper flow.
- C. Install fresh batteries in battery-powered, electronic-sensor mechanisms.
- 3.5 CLEANING AND PROTECTION
- A. Clean water closets and fittings with manufacturers' recommended cleaning methods and materials.
- B. Install protective covering for installed water closets and fittings.
- C. Do not allow use of water closets for temporary facilities unless approved in writing by the City.



**END OF SECTION 22 42 13.13**



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## SECTION 22 42 16.13 - COMMERCIAL LAVATORIES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Lavatories.
  - 2. Faucets.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for lavatories.
  - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings: Include diagrams for power, signal, and control wiring of automatic faucets.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For lavatories and faucets to include in operation and maintenance manuals.
  - 1. include the following:
    - a. Servicing and adjustments of automatic faucets.

#### 1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Faucet Washers and O-Rings: Equal to 10 percent of amount of each type and size installed.
  - 2. Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.

### PART 2 - PRODUCTS

#### 2.1 LAVATORIES

- A. Lavatories :
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:



- a. American Standard America.
- b. Kohler Co.
- c. Crane Plumbing
- 2. Standard: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
- 3. Material: Vitreous china.
- 4. Size: 20 inches x 18 inches.
- 5. Mounting and Outlet: Wall mounted, wall outlet.

2.2 LAVATORIES (ADA)

A. Lavatories :

- 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - a. American Standard America.
  - b. Kohler Co.
  - c. Crane Plumbing
- 2. Standard: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
- 3. Material: Vitreous china.
- 4. Size: 21-1/4 inches x 17-3/4 inches.
- 5. Mounting and Outlet: Self-riming drop in.

2.3 SOLID-BRASS, MANUALLY OPERATED FAUCETS

A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for faucet materials that will be in contact with potable water.

B. Lavatory Faucets : Manual-type, two-handle mixing, commercial, solid-brass valve.

- 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - a. Chicago Faucets; Geberit Company.
  - b. Elkay Manufacturing Co.
  - c. Kohler Co.
  - d. Moen Incorporated.
- 2. Standard: ASME A112.18.1/CSA B125.1.
- 3. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and fixture receptor.
- 4. Body Type: Centerset.
- 5. Body Material: Commercial, solid brass.
- 6. Finish: Polished chrome plate.
- 7. Maximum Flow Rate: 0.5 gpm.
- 8. Maximum Flow: 0.25 gal. per metering cycle.
- 9. Mounting Type: Deck, exposed.
- 10. Valve Handle(s): Single lever.
- 11. Spout: Rigid type.
- 12. Spout Outlet: Aerator.
- 13. Operation: Compression, manual.
- 14. Drain: Not part of faucet.





## 2.4 SUPPLY FITTINGS

- A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for supply-fitting materials that will be in contact with potable water.
- B. Standard: ASME A112.18.1/CSA B125.1.
- C. Supply Piping: Chrome-plated-brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated-brass or stainless-steel wall flange.
- D. Supply Stops: Chrome-plated-brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.
- E. Operation: Loose key.
- F. Risers:
  - 1. NPS 1/2.
  - 2. Chrome-plated, rigid-copper-pipe and brass straight or offset tailpieces riser.

## 2.5 WASTE FITTINGS

- A. Standard: ASME A112.18.2/CSA B125.2.
- B. Drain: Grid type with NPS 1-1/4 offset and straight tailpiece.
- C. Trap:
  - 1. Size: NPS 1-1/2 by NPS 1-1/4.
  - 2. Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch-thick brass tube to wall; and chrome-plated, brass or steel wall flange.
  - 3. Material: Stainless-steel, two-piece trap and swivel elbow with 0.012-inch-thick stainless-steel tube to wall; and stainless-steel wall flange.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before lavatory installation.
- B. Examine counters and walls for suitable conditions where lavatories will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Install lavatories level and plumb according to roughing-in drawings.
- B. Install supports, affixed to building substrate, for wall-mounted lavatories.



- C. Install accessible wall-mounted lavatories at handicapped/elderly mounting height for people with disabilities or the elderly, according to ICC/ANSI A117.1.
- D. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."
- E. Seal joints between lavatories, counters, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."
- F. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories as required by code.

### 3.3 CONNECTIONS

- A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."
- C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

### 3.4 ADJUSTING

- A. Operate and adjust lavatories and controls. Replace damaged and malfunctioning lavatories, fittings, and controls.
- B. Adjust water pressure at faucets to produce proper flow.
- C. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

### 3.5 CLEANING AND PROTECTION

- A. After completing installation of lavatories, inspect and repair damaged finishes.
- B. Clean lavatories, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.
- C. Provide protective covering for installed lavatories and fittings.
- D. Do not allow use of lavatories for temporary facilities unless approved in writing by the City.

**END OF SECTION 22 42 16.13**



## SECTION 22 42 16.16 - COMMERCIAL SINKS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Service sinks.
  - 2. Sink faucets.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for sinks.
  - 2. Include rated capacities, operating characteristics and furnished specialties and accessories.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For sinks to include in maintenance manuals.

#### 1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Faucet Washers and O-Rings: Equal to 10 percent of amount of each type and size installed.
  - 2. Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.

### PART 2 - PRODUCTS

#### 2.1 SERVICE SINKS

- A. Service Sinks: Vitreous china, trap standard mounted.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Crane Plumbing, L.L.C.
    - b. Kohler Co.
    - c. Zurn Industries, LLC; Commercial Brass and Fixtures.
  - 2. Fixture:
    - a. Standard: ASME A112.19.2/CSA B45.1.



- b. Type: Service sink with back.
  - c. Back: Two faucet holes.
  - d. Nominal Size: 22 by 20 inches.
  - e. Color: White.
  - f. Mounting: NPS 2 P-trap standard with grid strainer inlet, cleanout, and floor flange.
  - g. Rim Guard: On front and sides.
3. Support: ASME A112.6.1M, Type II, sink carrier.

2.2 SINK FAUCETS

- A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for faucet-spout materials that will be in contact with potable water.
- B. Sink Faucets : Manual type, single-control mixing valve.
  - 1. Commercial, Solid-Brass Faucets.
    - a. Manufacturers: Subject to compliance with requirements, provide products by the following :
    - b. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
      - 1) American Standard America.
      - 2) Chicago Faucets; Geberit Company.
      - 3) Elkay Manufacturing Co.
      - 4) Kohler Co.
      - 5) Moen Incorporated.
  - 2. Standard: ASME A112.18.1/CSA B125.1.
  - 3. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and sink receptor.
  - 4. Body Type: Centerset.
  - 5. Body Material: Commercial, solid brass.
  - 6. Finish: Chrome plated.
  - 7. Maximum Flow Rate: 2.2 gpm.
  - 8. Handle(s): Lever .
  - 9. Mounting Type: Deck, concealed.
  - 10. Spout Type: Rigid, solid brass .
  - 11. Vacuum Breaker: Required for hose outlet.
  - 12. Spout Outlet: Aerator.

2.3 GROUT

- A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.



## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before sink installation.
- B. Examine walls, floors, and counters for suitable conditions where sinks will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Install sinks level and plumb according to roughing-in drawings.
- B. Install supports, affixed to building substrate, for wall-hung sinks.
- C. Install accessible wall-mounted sinks at handicapped/elderly mounting height according to ICC/ANSI A117.1.
- D. Set floor-mounted sinks in leveling bed of cement grout.
- E. Install water-supply piping with stop on each supply to each sink faucet.
  - 1. Exception: Use ball or gate valves if supply stops are not specified with sink.
  - 2. Install stops in locations where they can be easily reached for operation.
- F. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."
- G. Seal joints between sinks and counters, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."
- H. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible sinks as required by code.

### 3.3 CONNECTIONS

- A. Connect sinks with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."
- C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."



3.4 ADJUSTING

- A. Operate and adjust sinks and controls. Replace damaged and malfunctioning sinks, fittings, and controls.
- B. Adjust water pressure at faucets to produce proper flow.

3.5 CLEANING AND PROTECTION

- A. After completing installation of sinks, inspect and repair damaged finishes.
- B. Clean sinks, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.
- C. Provide protective covering for installed sinks and fittings.
- D. Do not allow use of sinks for temporary facilities unless approved in writing by the City.

**END OF SECTION 22 42 16.16**



## SECTION 22 42 23 - COMMERCIAL SHOWERS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Individual shower receptors.
  - 2. Shower faucets.
- B. Related Requirements:
  - 1. Section 224100 "Residential Plumbing Fixtures" for residential showers.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for showers.
  - 2. Include rated capacities, operating characteristics, and furnished specialties and accessories.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For shower faucets to include in maintenance manuals.

#### 1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Faucet Washers and O-Rings: Equal to 10 percent of amount of each type and size installed.
  - 2. Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.

### PART 2 - PRODUCTS

#### 2.1 INDIVIDUAL SHOWERS

- A. Individual FRP Showers:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:



- a. Aqua Glass Corporation.
  - b. Clarion Bathware.
  - c. Florestone Products Co., Inc.
  - d. LASCO Bathware.
  - e. MAAX.
  - f. Praxis Industries, LLC.; Aquarius Bathware.
  - g. Sterling; a Kohler company.
  - h. Swan Corporation (The).
  - 3. General: FRP, accessible, shower enclosure with faucet and receptor and appurtenances.
  - 4. Standard: ANSI Z124.1.2.
  - 5. Type: One-piece unit with top.
  - 6. Style: Standard residential, Handicapped/wheelchair.
  - 7. Nominal Size and Shape: 48 by 34 to 36 inches rectangular.
  - 8. Bathing Surface: Slip resistant according to ASTM F 462.
  - 9. Outlet: Drain with NPS 2outlet.
  - 10. Shower Rod and Curtain: Required.
  - 11. Grab Bar: ASTM F 446, mounted on support area back wall.
- B. Individual PMMA Showers:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Acryline USA, Inc.
    - b. Aqua Bath Company, Inc.
    - c. Aqua Glass Corporation.
    - d. Aquatic Industries, Inc.
    - e. Clarion Bathware.
    - f. Crane Plumbing, L.L.C.
    - g. Jacuzzi Inc.
    - h. Kohler Co.
    - i. LASCO Bathware.
    - j. MAAX.
    - k. Praxis Industries, LLC.; Aquarius Bathware.
  - 3. General: PMMA shower enclosure with faucet and receptor and appurtenances.
  - 4. Standard: ANSI Z124.1.2.
  - 5. Type: One-piece unit with top.
  - 6. Style: Standard residential, Handicapped/wheelchair.
  - 7. Nominal Size and Shape: 48 by 34 to 36 inches rectangular.
  - 8. Color: White.
  - 9. Bathing Surface: Slip resistant according to ASTM F 462.
  - 10. Outlet: Drain with NPS 2 outlet.
  - 11. Shower Rod and Curtain: Required.
  - 12. Grab Bar: ASTM F 446, mounted on support area back wall.
- C. Individual Cabinet Showers:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:





- a. Bradley Corporation.
- b. Crane Plumbing, L.L.C.
- c. E. L. Mustee & Sons, Inc.
- d. Stern-Williams Co., Inc.
- e. Swan Corporation (The).
- 3. General: Factory-fabricated, accessible cabinet shower, with faucet and receptor.
- 4. Nominal Size: 36 by 36 inches.
- 5. Material: Stainless steel front access.
- 6. Accessibility Options: Grab bar and bench.
- 7. Faucet: Manufacturer's standard fitting assembly.
- 8. Supplies: NPS 1/2 copper tubing with ball valves.
- 9. Drain: Grid, NPS 2.

## 2.2 SHOWER FAUCETS

- A. NSF Standard: Comply with NSF 61 Annex G, "Drinking Water System Components - Health Effects," for shower materials that will be in contact with potable water.
- B. Shower Faucets:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. American Standard America.
    - b. Chicago Faucets.
    - c. FNW; Ferguson Enterprises, Inc.; ProFlo Brand.
    - d. Kohler Co.
    - e. Lawler Manufacturing Co., Inc.
    - f. Leonard Valve Company.
    - g. Matco-Norca.
    - h. Moen Incorporated.
    - i. Powers; a division of Watts Water Technologies, Inc.
    - j. Speakman Company.
    - k. Zurn Industries, LLC; AquaSpec Commercial Faucet Products.
  - 3. Description: Single-handle, pressure-balance mixing valve with hot- and cold-water indicators; check stops; and shower head.
  - 4. Faucet:
    - a. Standards: ASME A112.18.1/CSA B125.1 and ASSE 1016.
    - b. Body Material: Solid brass.
    - c. Finish: Polished chrome plate.
    - d. Maximum Flow Rate: 2.5 gpm unless otherwise indicated.
    - e. Mounting: Exposed.
    - f. Operation: Single-handle, push-pull control.
    - g. Antiscald Device: Integral with mixing valve
    - h. Check Stops: Check-valve type, integral with or attached to body; on hot- and cold-water supply connections.
  - 5. Supply Connections: NPS 1/2.
  - 6. Shower Head:
    - a. Standard: ASME A112.18.1/CSA B125.1.
    - b. Type: Ball joint with arm and flange
    - c. Shower Head Material: Metallic with chrome-plated finish.



- d. Spray Pattern: Adjustable .
  - e. Integral Volume Control: Required.
  - f. Shower-Arm, Flow-Control Fitting: 1.5 gpm.
  - g. Temperature Indicator: Integral with faucet.
- C. Shower Faucets :
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Chicago Faucets.
    - b. Lawler Manufacturing Co., Inc.
    - c. Leonard Valve Company.
    - d. Powers; a division of Watts Water Technologies, Inc.
  - 3. Description: Single-handle, thermostatic mixing valve with hot- and cold-water indicators; check stops; and shower head.
  - 4. Faucet:
    - a. Standards: ASME A112.18.1/CSA B125.1 and ASSE 1016.
    - b. Body Material: Solid brass.
    - c. Finish: Polished chrome plate.
    - d. Maximum Flow Rate: 2.5 gpm unless otherwise indicated.
    - e. Mounting: Exposed.
    - f. Operation: Single-handle, push-pull control.
    - g. Antiscald Device: Integral with mixing valve.
    - h. Check Stops: Check-valve type, integral with or attached to body; on hot- and cold-water supply connections.
  - 5. Supply Connections: NPS 1/2.
  - 6. Shower Head:
    - a. Standard: ASME A112.18.1/CSA B125.1.
    - b. Type: Ball joint with arm and flange
    - c. Shower Head Material: Metallic with chrome-plated finish.
    - d. Spray Pattern: Adjustable.
    - e. Integral Volume Control: Required.
    - f. Shower-Arm, Flow-Control Fitting: 1.5 gpm.
    - g. Temperature Indicator: Integral with faucet .

2.3 EXAMINATION

- A. Examine roughing-in of water-supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before shower installation.
- B. Examine walls and floors for suitable conditions where showers will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

2.4 INSTALLATION

- A. Assemble shower components according to manufacturers' written instructions.
- B. Install showers level and plumb according to roughing-in drawings.



- C. Install water-supply piping with stop on each supply to each shower faucet.
  - 1. Exception: Use ball or gate valves if supply stops are not specified with shower. Comply with valve requirements specified in Section 220523.12 "Ball Valves for Plumbing Piping" and Section 220523.15 "Gate Valves for Plumbing Piping."
  - 2. Install stops in locations where they can be easily reached for operation.
- D. Install shower flow-control fittings with specified maximum flow rates in shower arms.
- E. Set shower receptors in leveling bed of cement grout.
- F. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheons requirements specified in Section 220518 "Escutcheons for Plumbing Piping."
- G. Seal joints between showers and floors and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

## 2.5 CONNECTIONS

- A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."
- C. Comply with traps and soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

## 2.6 ADJUSTING

- A. Operate and adjust showers and controls. Replace damaged and malfunctioning showers, fittings, and controls.
- B. Adjust water pressure at faucets to produce proper flow.

## 2.7 CLEANING AND PROTECTION

- A. After completing installation of showers, inspect and repair damaged finishes.
- B. Clean showers, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.
- C. Provide protective covering for installed fixtures and fittings.
- D. Do not allow use of showers for temporary facilities unless approved in writing by Owner.

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



**END OF SECTION 22 42 23**



## SECTION 23 05 16 - EXPANSION FITTINGS AND LOOPS FOR HVAC PIPING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Flexible, ball-joint packed expansion joints.
  - 2. Slip-joint, packed expansion joints.
  - 3. Metal, compensator packless expansion joints.
  - 4. Alignment guides and anchors.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Delegated-Design Submittal: For each anchor and alignment guide, including analysis data, signed and sealed by the qualified professional engineer responsible for their preparation.
  - 1. Design Calculations: Calculate requirements for thermal expansion of piping systems and for selecting and designing expansion joints, loops, and swing connections.
  - 2. Anchor Details: Detail fabrication of each anchor indicated. Show dimensions and methods of assembly and attachment to building structure.
  - 3. Schedule: Indicate type, manufacturer's number, size, material, pressure rating, end connections, and location for each expansion joint.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For expansion joints to include in maintenance manuals.

#### 1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe and Pressure-Vessel Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.



**PART 2 - PRODUCTS**

2.1 PERFORMANCE REQUIREMENTS

- A. Compatibility: Products shall be suitable for piping service fluids, materials, working pressures, and temperatures.
- B. Capability: Products to absorb 200 percent of maximum axial movement between anchors.

2.2 PACKED EXPANSION JOINTS

- A. Flexible, Ball-Joint Packed Expansion Joints:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Advanced Thermal Systems, Inc.
    - b. Hyspan Precision Products, Inc.
    - c. Mason Industries, Inc.
  - 3. Standards: ASME Boiler and Pressure Vessel Code: Section II, "Materials"; ASME B31.9, "Building Services Piping," for materials and design of pressure-containing parts and bolting.
  - 4. Material: Carbon-steel assembly with asbestos-free composition packing.
  - 5. Design: Provide 360-degree rotation and angular deflection.
  - 6. Minimum Pressure Rating: 250 psig at 400 deg F.
  - 7. Angular Deflection for NPS 6 and Smaller: 30 degree minimum.
  - 8. Angular Deflection for NPS 8 and Larger: 15 degree minimum.
  - 9. Seal Type: Two carbon steel and graphite seals suitable for continuous operation at temperature up to 650 deg F.
  - 10. Internal Ball: Plated with minimum 1-mil chrome cover.
  - 11. Ball Socket: One- or two-piece design with integral socket/retainer.
    - a. Stuffing Box: Incorporates containment seals and compression seals for containment of injectable packing.
    - b. Packing Cylinders: Provides packing under full line pressure with check valves to prevent blowback.
  - 12. End Connections for NPS 2 and Smaller: Threaded.
  - 13. End Connections for NPS 2-1/2 and Larger: Flanged.
- B. Slip-Joint Packed Expansion Joints :
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide or comparable product by one of the following:
    - a. Adscos Manufacturing LLC.
    - b. Advanced Thermal Systems, Inc.
    - c. Hyspan Precision Products, Inc.
  - 3. Standard: ASTM F 1007.
  - 4. Material: Carbon steel with asbestos-free PTFE packing.
  - 5. Design: With internal guide and injection ports for repacking under full system pressure. Housing shall be furnished with drain ports and lifting ring. Include drip connection if used for steam piping.





6. Configuration: Single joint class(es), unless otherwise indicated.
7. Slip Tube for sizes NPS 1-1/2 through NPS 16: Schedule 80.
8. Slip Tube for sizes NPS 18 through NPS 24: Schedule 60.
9. Sliding Surface: 2 mil thick chrome finish.
10. End Connections: Flanged or welded ends to match piping system.

### 2.3 PACKLESS EXPANSION JOINTS

#### A. Metal, Compensator Packless Expansion Joints :

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Hyspan Precision Products, Inc.
  - b. Mason Industries, Inc.
  - c. Metraflex, Inc.
2. Minimum Pressure Rating: 200 psig, unless otherwise indicated.
3. Description: Totally enclosed, externally pressurized, multi-ply bellows isolated from fluid flow by an internal pipe sleeve and external housing.
4. Joint Axial Movement: 2 inches of compression and 1/2 inch of extension.
5. Configuration for Copper Tubing: Multi-ply, phosphor-bronze bellows with copper pipe ends.
  - a. End Connections for Copper Tubing NPS 2 and Smaller: Solder joint.
  - b. End Connections for Copper Tubing NPS 2-1/2 to NPS 4: Threaded.
6. Configuration for Steel Piping: Multi-ply, stainless-steel bellows; steel-pipe end connections; and carbon-steel shroud.
  - a. End Connections for Steel Pipe NPS 2 and Smaller: Threaded.
  - b. End Connections for Steel Pipe NPS 2-1/2 to NPS 4: Flanged.

### 2.4 ALIGNMENT GUIDES AND ANCHORS

#### A. Anchor Materials:

1. Steel Shapes and Plates: ASTM A 36/A 36M.
2. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel hex head.
3. Washers: ASTM F 844, steel, plain, flat washers.
4. Mechanical Fasteners: Insert-wedge-type stud with expansion plug anchor for use in hardened portland cement concrete, with tension and shear capacities appropriate for application.
  - a. Stud: Threaded, zinc-coated carbon steel.
  - b. Expansion Plug: Zinc-coated steel.
  - c. Washer and Nut: Zinc-coated steel.
5. Chemical Fasteners: Insert-type stud, bonding-system anchor for use with hardened portland cement concrete, with tension and shear capacities appropriate for application.
  - a. Bonding Material: ASTM C 881/C 881M, Type IV, Grade 3, two-component epoxy resin suitable for surface temperature of hardened concrete where fastener is to be installed.
  - b. Stud: ASTM A 307, zinc-coated carbon steel with continuous thread on stud, unless otherwise indicated.
  - c. Washer and Nut: Zinc-coated steel.



## PART 3 - EXECUTION

### 3.1 EXPANSION JOINT INSTALLATION

- A. Install expansion joints of sizes matching sizes of piping in which they are installed.
- B. Install packed-type expansion joints with packing suitable for fluid service.

### 3.2 ALIGNMENT-GUIDE AND ANCHOR INSTALLATION

- A. Install anchors at locations to prevent stresses from exceeding those permitted by ASME B31.9 and to prevent transfer of loading and stresses to connected equipment.
- B. Anchor Attachments:
  - 1. Anchor Attachment to Steel Pipe: Attach by welding. Comply with ASME B31.9 and ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
  - 2. Anchor Attachment to Copper Tubing: Attach with pipe hangers. Use MSS SP-69, Type 24; U bolts bolted to anchor.
- C. Fabricate and install steel anchors by welding steel shapes, plates, and bars. Comply with ASME B31.9 and AWS D1.1/D1.1M.
  - 1. Anchor Attachment to Steel Structural Members: Attach by welding.
  - 2. Anchor Attachment to Concrete Structural Members: Attach by fasteners. Follow fastener manufacturer's written instructions.
- D. Use grout to form flat bearing surfaces for guides and anchors attached to concrete.

**END OF SECTION 23 05 16**





## SECTION 23 05 17 - SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Sleeves.
  - 2. Stack-sleeve fittings.
  - 3. Sleeve-seal systems.
  - 4. Sleeve-seal fittings.
  - 5. Grout.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

### PART 2 - PRODUCTS

#### 2.1 STACK-SLEEVE FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Smith, Jay R. Mfg. Co.
  - 2. Zurn Specification Drainage Operation; Zurn Plumbing Products Group.
- B. Description: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring, bolts, and nuts for membrane flashing.
  - 1. Underdeck Clamp: Clamping ring with setscrews.

#### 2.2 SLEEVE-SEAL SYSTEMS

- A. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
  - 1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
  - 2. Pressure Plates: Carbon steel.
  - 3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

#### 2.3 SLEEVE-SEAL FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:



1. Presealed Systems.

- B. Description: Manufactured plastic, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall. Unit has plastic or rubber waterstop collar with center opening to match piping OD.

2.4 GROUT

- A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

**PART 3 - EXECUTION**

3.1 SLEEVE INSTALLATION

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
- B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.
1. Sleeves are not required for core-drilled holes.
- C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
2. Cut sleeves to length for mounting flush with both surfaces.
- a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.
3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.
- D. Install sleeves for pipes passing through interior partitions.
1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint.
- E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials.

3.2 STACK-SLEEVE-FITTING INSTALLATION

- A. Install stack-sleeve fittings in new slabs as slabs are constructed.



1. Install fittings that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
  2. Secure flashing between clamping flanges for pipes penetrating floors with membrane waterproofing. Comply with requirements for flashing specified in Section 076200 "Sheet Metal Flashing and Trim."
  3. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.
  4. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
  5. Using grout, seal the space around outside of stack-sleeve fittings.
- B. Fire-Barrier Penetrations: Maintain indicated fire rating of floors at pipe penetrations. Seal pipe penetrations with firestop materials.
- 3.3 SLEEVE-SEAL-SYSTEM INSTALLATION
- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.
  - B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.
- 3.4 SLEEVE-SEAL-FITTING INSTALLATION
- A. Install sleeve-seal fittings in new walls and slabs as they are constructed.
  - B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.
  - C. Secure nailing flanges to concrete forms.
  - D. Using grout, seal the space around outside of sleeve-seal fittings.
- 3.5 SLEEVE AND SLEEVE-SEAL SCHEDULE
- A. Use sleeves and sleeve seals for the following piping-penetration applications:
    1. Exterior Concrete Walls above Grade:
      - a. Piping Smaller Than NPS 6: Cast-iron wall sleeves Galvanized-steel wall sleeves Galvanized-steel-pipe sleeves Sleeve-seal fittings .
    2. Concrete Slabs above Grade:
      - a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves PVC-pipe sleeves Stack-sleeve fittings Sleeve-seal fittings Molded-PE or -PP sleeves Molded-PVC sleeves .
    3. Interior Partitions:
      - a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves PVC-pipe sleeves .

**END OF SECTION 23 05 17**



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## SECTION 23 05 18 - ESCUTCHEONS FOR HVAC PIPING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Escutcheons.
  - 2. Floor plates.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

### PART 2 - PRODUCTS

#### 2.1 ESCUTCHEONS

- A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.
- C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.
- D. Split-Casting Brass Type: With polished, chrome-plated finish and with concealed hinge and setscrew.
- E. Split-Plate, Stamped-Steel Type: With chrome-plated finish, concealed hinge, and spring-clip fasteners.

#### 2.2 FLOOR PLATES

- A. One-Piece Floor Plates: Cast-iron flange.
- B. Split-Casting Floor Plates: Cast brass with concealed hinge.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.



- B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
  - 1. Escutcheons for New Piping:
    - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
    - b. Insulated Piping: One-piece, stamped-steel type.
    - c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
    - d. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
    - e. Bare Piping in Equipment Rooms: One-piece, cast-brass type with polished, chrome-plated finish.
  - 2. Escutcheons for Existing Piping:
    - a. Chrome-Plated Piping: Split-casting brass type with polished, chrome-plated finish.
    - b. Insulated Piping: Split-plate, stamped-steel type with concealed hinge.
    - c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-casting brass type with polished, chrome-plated finish.
    - d. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-casting brass type with polished, chrome-plated finish.
    - e. Bare Piping in Equipment Rooms: Split-casting brass type with polished, chrome-plated finish.
- C. Install floor plates for piping penetrations of equipment-room floors.

### 3.2 FIELD QUALITY CONTROL

- A. Replace broken and damaged escutcheons and floor plates using new materials.

**END OF SECTION 23 05 18**



## SECTION 23 05 29 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Metal pipe hangers and supports.
  - 2. Trapeze pipe hangers.
  - 3. Thermal-hanger shield inserts.
  - 4. Fastener systems.
  - 5. Pipe stands.
  - 6. Equipment supports.
- B. Related Sections:
  - 1. Section 230516 "Expansion Fittings and Loops for HVAC Piping" for pipe guides and anchors.
  - 2. Section 230548 "Vibration and Seismic Controls for HVAC" for vibration isolation devices.
  - 3. Section 233113 "Metal Ducts" for duct hangers and supports.

#### 1.3 DEFINITIONS

- A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

#### 1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
  - 1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
  - 2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
  - 3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

#### 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.



- B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following; include Product Data for components:
    - 1. Trapeze pipe hangers.
    - 2. Equipment supports.
  - C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
    - 1. Detail fabrication and assembly of trapeze hangers.
    - 2. Design Calculations: Calculate requirements for designing trapeze hangers.
- 1.6 QUALITY ASSURANCE
- A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
  - B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

## PART 2 - PRODUCTS

### 2.1 METAL PIPE HANGERS AND SUPPORTS

- A. Carbon-Steel Pipe Hangers and Supports:
  - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
  - 2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
  - 3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
  - 4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
  - 5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
- B. Stainless-Steel Pipe Hangers and Supports:
  - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
  - 2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
  - 3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

### 2.2 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

### 2.3 THERMAL-HANGER SHIELD INSERTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:





- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - 1. Carpenter & Paterson, Inc.
  - 2. Clement Support Services.
  - 3. ERICO International Corporation.
  - 4. National Pipe Hanger Corporation.
  - 5. PHS Industries, Inc.
  - 6. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.
  - 7. Piping Technology & Products, Inc.
  - 8. Rilco Manufacturing Co., Inc.
  - 9. Value Engineered Products, Inc.
  - 10. .
- C. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psi minimum compressive strength and vapor barrier.
- D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- F. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

#### 2.4 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

#### 2.5 PIPE STANDS

- A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.
- B. Compact Pipe Stand: One-piece plastic unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.

#### 2.6 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

#### 2.7 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.



- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
  - 1. Properties: Nonstaining, noncorrosive, and nongaseous.
  - 2. Design Mix: 5000-psi, 28-day compressive strength.

### PART 3 - EXECUTION

#### 3.1 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
  - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
  - 2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
- C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- D. Fastener System Installation:
  - 1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
  - 2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- E. Pipe Stand Installation:
  - 1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
  - 2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb.
- F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- I. Install lateral bracing with pipe hangers and supports to prevent swaying.



- J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- K. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- M. Insulated Piping:
  - 1. Attach clamps and spacers to piping.
    - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
  - 2. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
    - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
  - 3. Shield Dimensions for Pipe: Not less than the following:
    - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
    - b. NPS 4: 12 inches long and 0.06 inch thick.
  - 4. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

### 3.2 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

### 3.3 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.



2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

#### 3.4 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

#### 3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
  1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

#### 3.6 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use carbon-steel pipe hangers and supports metal trapeze pipe hangers and attachments for general service applications.
- F. Use stainless-steel pipe hangers and stainless-steel attachments for hostile environment applications.
- G. Use thermal-hanger shield inserts for insulated piping and tubing.
- H. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
- I. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:



1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
  
- J. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  1. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
  
- K. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  1. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joint construction, to attach to top flange of structural shape.
  2. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
  3. C-Clamps (MSS Type 23): For structural shapes.
  
- L. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  1. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
  2. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
  
- M. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
  2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
  3. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
  4. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
  5. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
  
- N. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
  
- O. Use powder-actuated fasteners mechanical-expansion anchors instead of building attachments where required in concrete construction.

**END OF SECTION 23 05 29**



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## SECTION 23 05 48 - VIBRATION AND SEISMIC CONTROLS FOR HVAC

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Housed-spring isolators.
  - 2. Restrained-spring isolators.
  - 3. Housed-restrained-spring isolators.
  - 4. Pipe-riser resilient supports.
  - 5. Spring hangers.
  - 6. Seismic-restraint accessories.
  - 7. Mechanical anchor bolts.
  - 8. Vibration isolation equipment bases.

#### 1.3 DEFINITIONS

- A. CBC: California Building Code.
- B. ICC-ES: ICC-Evaluation Service.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
  - 2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of vibration isolation device and seismic-restraint component required.
    - a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an agency acceptable to authorities having jurisdiction.
    - b. Annotate to indicate application of each product submitted and compliance with requirements.
  - 3. Interlocking Snubbers: Include ratings for horizontal, vertical, and combined loads.
- B. Shop Drawings:
  - 1. Detail fabrication and assembly of equipment bases. Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
  - 2. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.



- C. Delegated-Design Submittal: For each vibration isolation and seismic-restraint device.
  - 1. Include design calculations and details for selecting vibration isolators, seismic restraints, and vibration isolation bases complying with performance requirements, design criteria, and analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
  - 2. Design Calculations: Calculate static and dynamic loading due to equipment weight, operation, and seismic and wind forces required to select vibration isolators and seismic and wind restraints and for designing vibration isolation bases.
    - a. Coordinate design calculations with wind load calculations required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.
  - 3. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, spring deflection changes, and seismic loads. Include certification that riser system was examined for excessive stress and that none exists.
  - 4. Seismic- and Wind-Restraint Details:
    - a. Design Analysis: To support selection and arrangement of seismic and wind restraints. Include calculations of combined tensile and shear loads.
    - b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
    - c. Coordinate seismic-restraint and vibration isolation details with wind-restraint details required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.
    - d. Preapproval and Evaluation Documentation: By an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Show coordination of vibration isolation device installation and seismic bracing for HVAC piping and equipment with other systems and equipment in the vicinity, including other supports and restraints, if any.
- B. Qualification Data: For professional engineer and testing agency.
- C. Welding certificates.
- D. Air-Mounting System Performance Certification: Include natural frequency, load, and damping test data performed by an independent agency.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For to include in operation and maintenance manuals.





1.7 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7 and that is acceptable to authorities having jurisdiction.
- B. Comply with seismic-restraint requirements in the CBC unless requirements in this Section are more stringent.
- C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- D. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are unavailable, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

**PART 2 - PRODUCTS**

2.1 PERFORMANCE REQUIREMENTS

- A. Wind-Restraint Loading:
  - 1. Building Classification Category: II.
  - 2. Minimum 10 lb/sq. ft. multiplied by maximum area of HVAC component projected on vertical plane normal to wind direction, and 45 degrees either side of normal.
- B. Seismic-Restraint Loading:
  - 1. Site Class as Defined in the CBC: B.
  - 2. Assigned Seismic Use Group or Building Category as Defined in the CBC: II.
    - a. Component Importance Factor: 1.0.
    - b. Component Response Modification Factor: 1.5.
    - c. Component Amplification Factor: 1.0.
  - 3. Rated strengths, features, and applications shall be as defined in reports by an agency acceptable to authorities having jurisdiction.
    - a. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they are subjected.

2.2 HOUSED-SPRING ISOLATORS

- A. Freestanding, Laterally Stable, Open-Spring Isolators in Two-Part Telescoping Housing:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Isolation Technology, Inc.





- b. Kinetics Noise Control, Inc.
- c. Mason Industries, Inc.
- 3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
- 4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
- 5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
- 6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
- 7. Two-Part Telescoping Housing: A steel top and bottom frame separated by an elastomeric material and enclosing the spring isolators.
  - a. Drilled base housing for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.
  - b. Top housing with attachment and leveling bolt.

2.3 RESTRAINED-SPRING ISOLATORS

- A. Freestanding, Laterally Stable, Open-Spring Isolators with Vertical-Limit Stop Restraint:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Isolation Technology, Inc.
    - b. Kinetics Noise Control, Inc.
    - c. Mason Industries, Inc.
  - 3. Housing: Steel housing with vertical-limit stops to prevent spring extension due to weight being removed.
    - a. Base with holes for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.
    - b. Top plate with threaded mounting holes.
    - c. Internal leveling bolt that acts as blocking during installation.
  - 4. Restraint: Limit stop as required for equipment and authorities having jurisdiction.
  - 5. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
  - 6. Minimum Additional Travel: 50 percent of the required deflection at rated load.
  - 7. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
  - 8. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2.4 HOUSED-RESTRAINED-SPRING ISOLATORS

- A. Freestanding, Steel, Open-Spring Isolators with Vertical-Limit Stop Restraint in Two-Part Telescoping Housing:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Isolation Technology, Inc.
    - b. Kinetics Noise Control, Inc.
    - c. Mason Industries, Inc.
  - 3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.





4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

## 2.5 PIPE-RISER RESILIENT SUPPORT

- A. Description: All-directional, acoustical pipe anchor consisting of two steel tubes separated by a minimum 1/2-inch- thick neoprene .
1. Vertical-Limit Stops: Steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions.
  2. Maximum Load Per Support: 500 psigon isolation material providing equal isolation in all directions.

## 2.6 SPRING HANGERS

- A. Combination Coil-Spring and Elastomeric-Insert Hanger with Spring and Insert in Compression: .
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. California Dynamics Corporation.
    - b. Kinetics Noise Control, Inc.
    - c. Mason Industries, Inc.
  3. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
  4. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
  5. Minimum Additional Travel: 50 percent of the required deflection at rated load.
  6. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
  7. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
  8. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
  9. Adjustable Vertical Stop: Steel washer with neoprene washer "up-stop" on lower threaded rod.
  10. Self-centering hanger-rod cap to ensure concentricity between hanger rod and support spring coil.

## 2.7 SEISMIC-RESTRAINT ACCESSORIES

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Cooper B-Line, Inc.
  2. Kinetics Noise Control, Inc.



3. Mason Industries, Inc.

- C. Hanger-Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.
- D. Hinged and Swivel Brace Attachments: Multifunctional steel connectors for attaching hangers to rigid channel bracings.
- E. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.
- F. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices used.
- G. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

2.8 MECHANICAL ANCHOR BOLTS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - 1. Cooper B-Line, Inc.
  - 2. Hilti, Inc.
  - 3. Mason Industries, Inc.
- C. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

2.9 VIBRATION ISOLATION EQUIPMENT BASES

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - 1. California Dynamics Corporation.
  - 2. Kinetics Noise Control.
  - 3. Mason Industries, Inc.
- C. Steel Bases: Factory-fabricated, welded, structural-steel bases and rails.
  - 1. Design Requirements: Lowest possible mounting height with not less than 1-inch clearance above the floor. Include equipment anchor bolts and auxiliary motor slide bases or rails.
    - a. Include supports for suction and discharge elbows for pumps.
  - 2. Structural Steel: Steel shapes, plates, and bars complying with ASTM A 36/A 36M. Bases shall have shape to accommodate supported equipment.



3. Support Brackets: Factory-welded steel brackets on frame for outrigger isolation mountings and to provide for anchor bolts and equipment support.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine areas and equipment to receive vibration isolation and seismic- and wind-control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### **3.2 APPLICATIONS**

- A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.
- B. Hanger-Rod Stiffeners: Install hanger-rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.
- C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength is adequate to carry present and future static and seismic loads within specified loading limits.

#### **3.3 VIBRATION CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION**

- A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete."
- B. Installation of vibration isolators must not cause any change of position of equipment, piping, or ductwork resulting in stresses or misalignment.
- C. Equipment Restraints:
  1. Install seismic snubbers on HVAC equipment mounted on vibration isolators. 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 where clearance between anchor and adjacent surface exceeds 0.125 inch.
  3. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction that provides required submittals for component.
- D. Piping Restraints:
  1. Comply with requirements in MSS SP-127.



2. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
  3. Brace a change of direction longer than 12 feet.
- E. Install cables so they do not bend across edges of adjacent equipment or building structure.
- F. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction that provides required submittals for component.
- G. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.
- H. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.
- I. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.
- J. Drilled-in Anchors:
1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
  2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
  3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
  4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
  5. Set anchors to manufacturer's recommended torque, using a torque wrench.
  6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

### 3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

- A. Install flexible connections in piping where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment.

### 3.5 FIELD QUALITY CONTROL

- A. Tests and Inspections:
1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.



2. Schedule test with the City, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days' advance notice.
  3. Obtain City's approval before transmitting test loads to structure. Provide temporary load-spreading members.
  4. Test at least four of each type and size of installed anchors and fasteners selected by City.
  5. Test to 90 percent of rated proof load of device.
  6. Measure isolator restraint clearance.
  7. Measure isolator deflection.
  8. Verify snubber minimum clearances.
  9. Test and adjust restrained-air-spring isolator controls and safeties.
- B. Remove and replace malfunctioning units and retest as specified above.
- C. Prepare test and inspection reports.
- 3.6 ADJUSTING
- A. Adjust isolators after piping system is at operating weight.
  - B. 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.
- 3.7 VIBRATION ISOLATION EQUIPMENT BASES INSTALLATION
- A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete."

**END OF SECTION 23 05 48**



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## SECTION 23 05 53 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Equipment labels.
  - 2. Warning signs and labels.
  - 3. Pipe labels.
  - 4. Duct labels.
  - 5. Stencils.
  - 6. Valve tags.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For color, letter style, and graphic representation required for each identification material and device.
- C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.
- D. Valve numbering scheme.
- E. Valve Schedules: For each piping system to include in maintenance manuals.

### PART 2 - PRODUCTS

#### 2.1 EQUIPMENT LABELS

- A. Metal Labels for Equipment:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Brady Corporation.
    - b. Brimar Industries, Inc.
    - c. Carlton Industries, LP.
  - 3. Material and Thickness: stainless steel, 0.025-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
  - 4. Letter Color: White.
  - 5. Background Color: Black.



6. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
  7. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
  8. Fasteners: Stainless-steel rivets.
  9. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- B. Plastic Labels for Equipment:
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Brady Corporation.
    - b. Brimar Industries, Inc.
    - c. Carlton Industries, LP.
  3. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
  4. Letter Color: White.
  5. Background Color: Black.
  6. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
  7. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
  8. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
  9. Fasteners: Stainless-steel rivets.
  10. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.
- D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number, and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

## 2.2 WARNING SIGNS AND LABELS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Brady Corporation.
  2. Brimar Industries, Inc.
  3. Carlton Industries, LP.



- C. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
- D. Letter Color: White.
- E. Background Color: Black.
- F. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- G. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- H. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
- I. Fasteners: Stainless-steel rivets.
- J. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- K. Label Content: Include caution and warning information plus emergency notification instructions.

### 2.3 PIPE LABELS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - 1. Brady Corporation.
  - 2. Brimar Industries, Inc.
  - 3. Carlton Industries, LP.
- B. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction according to ASME A13.1.
- C. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.
- D. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- E. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.
  - 1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
  - 2. Lettering Size: Size letters according to ASME A13.1 for piping.

### 2.4 DUCT LABELS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - 1. Brady Corporation.



2. Brimar Industries, Inc.
  3. Carlton Industries, LP.
- B. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
- C. Letter Color: White.
- D. Background Color: Black.
- E. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- F. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- G. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
- H. Fasteners: Stainless-steel rivets.
- I. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- J. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings; also include duct size and an arrow indicating flow direction.
1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions or as separate unit on each duct label to indicate flow direction.

## 2.5 STENCILS

- A. Stencils for Piping:
1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Brimar Industries, Inc.
    - b. Carlton Industries, LP.
    - c. Champion America.
  2. Lettering Size: Size letters according to ASME A13.1 for piping.
  3. Stencil Material: Aluminum.
  4. Stencil Paint: Exterior, gloss, acrylic enamel in colors complying with recommendations in ASME A13.1 unless otherwise indicated. Paint may be in pressurized spray-can form.
  5. Identification Paint: Exterior, acrylic enamel in colors according to ASME A13.1 unless otherwise indicated. Paint may be in pressurized spray-can form.
- B. Stencils for Ducts:
1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Brimar Industries, Inc.
    - b. Carlton Industries, LP.
    - c. Champion America.



2. Lettering Size: Minimum letter height of 1-1/4 inches for viewing distances up to 15 feet and proportionately larger lettering for greater viewing distances.
3. Stencil Material: Aluminum.
4. Stencil Paint: Exterior, gloss, acrylic enamel. Paint may be in pressurized spray-can form.
5. Identification Paint: Exterior, acrylic enamel. Paint may be in pressurized spray-can form.

## 2.6 VALVE TAGS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  1. Brady Corporation.
  2. Brimar Industries, Inc.
  3. Carlton Industries, LP.
- B. Description: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.
  1. Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
  2. Fasteners: Brass wire-link chain.
- C. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
  1. Valve-tag schedule shall be included in operation and maintenance data.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

### 3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

### 3.3 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.



### 3.4 PIPE LABEL INSTALLATION

- A. Piping Color Coding: Painting of piping is specified in Section 099123 "Interior Painting."
- B. Stenciled Pipe Label Option: Stenciled labels may be provided instead of manufactured pipe labels, at Installer's option. Install stenciled pipe labels, complying with ASME A13.1, with painted, color-coded bands or rectangles on each piping system.
  - 1. Identification Paint: Use for contrasting background.
  - 2. Stencil Paint: Use for pipe marking.
- C. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
  - 1. Near each valve and control device.
  - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
  - 3. Near penetrations and on both sides of through walls, floors, ceilings, and inaccessible enclosures.
  - 4. At access doors, manholes, and similar access points that permit view of concealed piping.
  - 5. Near major equipment items and other points of origination and termination.
  - 6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
  - 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.
- D. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.
- E. Pipe Label Color Schedule:
  - 1. Refrigerant Piping: Black letters on a safety-white background.

### 3.5 DUCT LABEL INSTALLATION

- A. Install self-adhesive duct labels with permanent adhesive on air ducts in the following color codes:
  - 1. Blue: For cold-air supply ducts.
  - 2. Yellow: For hot-air supply ducts.
  - 3. Green: For exhaust-, outside-, relief-, return-, and mixed-air ducts.
- B. Stenciled Duct Label Option: Stenciled labels showing service and flow direction may be provided instead of plastic-laminated duct labels, at Installer's option.
- C. Locate labels near points where ducts enter into and exit from concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling system.



**3.6 VALVE-TAG INSTALLATION**

- A. Install tags on valves and control devices in piping systems, except check valves, valves within factory-fabricated equipment units, shutoff valves, faucets, convenience and lawn-watering hose connections, and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.
- B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:
  - 1. Valve-Tag Size and Shape:
    - a. Refrigerant: 1-1/2 inches, round.
    - b. Gas: 1-1/2 inches, round.
  - 2. Valve-Tag Colors:
    - a. Toxic and Corrosive Fluids: Black letters on a safety-orange background.
    - b. Flammable Fluids: Black letters on a safety-yellow background.
    - c. Combustible Fluids: White letters on a safety-brown background.
    - d. Potable and Other Water: White letters on a safety-green background.
    - e. Compressed Air: White letters on a safety-blue background.
    - f. Defined by User: White letters on a safety-purple background, black letters on a safety-white background, white letters on a safety-gray background, and white letters on a safety-black background

**END OF SECTION 23 05 53**



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## SECTION 23 05 93 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Balancing Air Systems:
    - a. Constant-volume air systems.
  - 2. Balancing Hydronic Piping Systems:
    - a. Variable-flow hydronic systems.
  - 3. Testing, Adjusting, and Balancing Equipment:
    - a. Condensing units.
  - 4. Sound tests.
  - 5. Vibration tests.
  - 6. Duct leakage tests.
  - 7. Control system verification.

#### 1.2 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. BAS: Building automation systems.
- C. NEBB: National Environmental Balancing Bureau.
- D. TAB: Testing, adjusting, and balancing.
- E. TABB: Testing, Adjusting, and Balancing Bureau.
- F. TAB Specialist: An independent entity meeting qualifications to perform TAB work.
- G. TDH: Total dynamic head.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: Within 30 days of Contractor's Notice to Proceed, submit documentation that the TAB specialist and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.
- B. Contract Documents Examination Report: Within 30 days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3.
- C. Strategies and Procedures Plan: Within 30 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.
- D. System Readiness Checklists: Within 30 days of Contractor's Notice to Proceed, submit system readiness checklists as specified in "Preparation" Article.



- E. Examination Report: Submit a summary report of the examination review required in "Examination" Article.
- F. Sample report forms.
- G. Instrument calibration reports, to include the following:
  - 1. Instrument type and make.
  - 2. Serial number.
  - 3. Application.
  - 4. Dates of use.
  - 5. Dates of calibration.

**1.4 QUALITY ASSURANCE**

- A. TAB Specialists Qualifications: Certified by NEBB .
  - 1. TAB Field Supervisor: Employee of the TAB specialist and certified by NEBB .
  - 2. TAB Technician: Employee of the TAB specialist and certified by NEBB as a TAB technician.
- B. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."

**1.5 FIELD CONDITIONS**

- A. Full City Occupancy: The City will occupy the site and existing building during entire TAB period. Cooperate with the City during TAB operations to minimize conflicts with the City's operations.
- B. Partial Owner Occupancy: City may occupy completed areas of building before Substantial Completion. Cooperate with the City during TAB operations to minimize conflicts with the City's operations.

**PART 2 - PRODUCTS (Not Applicable)**

**PART 3 - EXECUTION**

**3.1 TAB SPECIALISTS**

- A. Subject to compliance with requirements, engage one of the following:
  - 1. Approved by City.

**3.2 EXAMINATION**

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.



- B. Examine installed systems for balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are applicable for intended purpose and are accessible.
- C. Examine the approved submittals for HVAC systems and equipment.
- D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.
- F. Examine equipment performance data including fan and pump curves.
  - 1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
  - 2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.
- G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- H. Examine test reports specified in individual system and equipment Sections.
- I. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.
- J. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.
- K. Examine strainers. Verify that startup screens have been replaced by permanent screens with indicated perforations.
- L. Examine control valves for proper installation for their intended function of throttling, diverting, or mixing fluid flows.
- M. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- N. Examine system pumps to ensure absence of entrained air in the suction piping.
- O. Examine operating safety interlocks and controls on HVAC equipment.
- P. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.



3.3 PREPARATION

- A. Prepare a TAB plan that includes the following:
  - 1. Equipment and systems to be tested.
  - 2. Strategies and step-by-step procedures for balancing the systems.
  - 3. Instrumentation to be used.
  - 4. Sample forms with specific identification for all equipment.
  
- B. Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:
  - 1. Airside:
    - a. Verify that leakage and pressure tests on air distribution systems have been satisfactorily completed.
    - b. Duct systems are complete with terminals installed.
    - c. Volume, smoke, and fire dampers are open and functional.
    - d. Clean filters are installed.
    - e. Fans are operating, free of vibration, and rotating in correct direction.
    - f. Variable-frequency controllers' startup is complete and safeties are verified.
    - g. Automatic temperature-control systems are operational.
    - h. Ceilings are installed.
    - i. Windows and doors are installed.
    - j. Suitable access to balancing devices and equipment is provided.
  - 2. Hydronics:
    - a. Verify leakage and pressure tests on water distribution systems have been satisfactorily completed.
    - b. Piping is complete with terminals installed.
    - c. Water treatment is complete.
    - d. Systems are flushed, filled, and air purged.
    - e. Strainers are pulled and cleaned.
    - f. Control valves are functioning per the sequence of operation.
    - g. Shutoff and balance valves have been verified to be 100 percent open.
    - h. Pumps are started and proper rotation is verified.
    - i. Pump gage connections are installed directly at pump inlet and outlet flanges or in discharge and suction pipe prior to valves or strainers.
    - j. Variable-frequency controllers' startup is complete and safeties are verified.
    - k. Suitable access to balancing devices and equipment is provided.

3.4 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and in this Section.
  
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
  - 1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
  - 2. After testing and balancing, install test ports and duct access doors that comply with requirements in Section 233300 "Air Duct Accessories."



3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 230713 "Duct Insulation," and Section 230719 "HVAC Piping Insulation."
- C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

### 3.5 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Cross-check the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts.
- C. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.
- D. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.
- E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- F. Verify that motor starters are equipped with properly sized thermal protection.
- G. Check dampers for proper position to achieve desired airflow path.
- H. Check for airflow blockages.
- I. Check condensate drains for proper connections and functioning.
- J. Check for proper sealing of air-handling-unit components.
- K. Verify that air duct system is sealed as specified in Section 233113 "Metal Ducts."

### 3.6 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
  1. Measure total airflow.
    - a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.
    - b. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.
    - c. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
    - d. If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.



2. Measure fan static pressures as follows:
    - a. Measure static pressure directly at the fan outlet or through the flexible connection.
    - b. Measure static pressure directly at the fan inlet or through the flexible connection.
    - c. Measure static pressure across each component that makes up the air-handling system.
    - d. Report artificial loading of filters at the time static pressures are measured.
  3. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
  4. Obtain approval from the City for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
  5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload occurs. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.
- B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows.
1. Measure airflow of submain and branch ducts.
  2. Adjust submain and branch duct volume dampers for specified airflow.
  3. Re-measure each submain and branch duct after all have been adjusted.
- C. Adjust air inlets and outlets for each space to indicated airflows.
1. Set airflow patterns of adjustable outlets for proper distribution without drafts.
  2. Measure inlets and outlets airflow.
  3. Adjust each inlet and outlet for specified airflow.
  4. Re-measure each inlet and outlet after they have been adjusted.
- D. Verify final system conditions.
1. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to design if necessary.
  2. Re-measure and confirm that total airflow is within design.
  3. Re-measure all final fan operating data, rpms, volts, amps, and static profile.
  4. Mark all final settings.
  5. Test system in economizer mode. Verify proper operation and adjust if necessary.
  6. Measure and record all operating data.
  7. Record final fan-performance data.

### 3.7 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

- A. Prepare test reports for pumps, coils, and heat exchangers. Obtain approved submittals and manufacturer-recommended testing procedures. Crosscheck the summation of required coil and heat exchanger flow rates with pump design flow rate.
- B. Prepare schematic diagrams of systems' "as-built" piping layouts.
- C. In addition to requirements in "Preparation" Article, prepare hydronic systems for testing and balancing as follows:



1. Check liquid level in expansion tank.
2. Check highest vent for adequate pressure.
3. Check flow-control valves for proper position.
4. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
5. Verify that motor starters are equipped with properly sized thermal protection.
6. Check that air has been purged from the system.

### 3.8 PROCEDURES FOR VARIABLE-FLOW HYDRONIC SYSTEMS

- A. Balance systems with automatic two- and three-way control valves by setting systems at maximum flow through heat-exchange terminals, and proceed as specified above for hydronic systems.
- B. Adjust the variable-flow hydronic system as follows:
  1. Verify that the differential-pressure sensor is located as indicated.
  2. Determine whether there is diversity in the system.
- C. For systems with no diversity:
  1. Adjust pumps to deliver total design gpm.
    - a. Measure total water flow.
      - 1) Position valves for full flow through coils.
      - 2) Measure flow by main flow meter, if installed.
      - 3) If main flow meter is not installed, determine flow by pump TDH or exchanger pressure drop.
    - b. Measure pump TDH as follows:
      - 1) Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
      - 2) Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
      - 3) Convert pressure to head and correct for differences in gage heights.
      - 4) Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.
      - 5) With valves open, read pump TDH. Adjust pump discharge valve until design water flow is achieved.
    - c. Monitor motor performance during procedures and do not operate motor in an overloaded condition.
  2. Adjust flow-measuring devices installed in mains and branches to design water flows.
    - a. Measure flow in main and branch pipes.
    - b. Adjust main and branch balance valves for design flow.
    - c. Re-measure each main and branch after all have been adjusted.
  3. Adjust flow-measuring devices installed at terminals for each space to design water flows.
    - a. Measure flow at terminals.
    - b. Adjust each terminal to design flow.
    - c. Re-measure each terminal after it is adjusted.
    - d. Position control valves to bypass the coil and adjust the bypass valve to maintain design flow.
    - e. Perform temperature tests after flows have been balanced.
  4. For systems with pressure-independent valves at terminals:





- a. Measure differential pressure and verify that it is within manufacturer's specified range.
  - b. Perform temperature tests after flows have been verified.
  5. For systems without pressure-independent valves or flow-measuring devices at terminals:
    - a. Measure and balance coils by either coil pressure drop or temperature method.
    - b. If balanced by coil pressure drop, perform temperature tests after flows have been verified.
  6. Prior to verifying final system conditions, determine the system differential-pressure set point.
  7. If the pump discharge valve was used to set total system flow with variable-frequency controller at 60 Hz, at completion open discharge valve 100 percent and allow variable-frequency controller to control system differential-pressure set point. Record pump data under both conditions.
  8. Mark final settings and verify that all memory stops have been set.
  9. Verify final system conditions as follows:
    - a. Re-measure and confirm that total water flow is within design.
    - b. Re-measure final pumps' operating data, TDH, volts, amps, and static profile.
    - c. Mark final settings.
  10. Verify that memory stops have been set.
- D. For systems with diversity:
1. Determine diversity factor.
  2. Simulate system diversity by closing required number of control valves, as approved by the design engineer.
  3. Adjust pumps to deliver total design gpm.
    - a. Measure total water flow.
      - 1) Position valves for full flow through coils.
      - 2) Measure flow by main flow meter, if installed.
      - 3) If main flow meter is not installed, determine flow by pump TDH or exchanger pressure drop.
    - b. Measure pump TDH as follows:
      - 1) Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
      - 2) Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
      - 3) Convert pressure to head and correct for differences in gage heights.
      - 4) Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.
      - 5) With valves open, read pump TDH. Adjust pump discharge valve until design water flow is achieved.
    - c. Monitor motor performance during procedures and do not operate motor in an overloaded condition.
  4. Adjust flow-measuring devices installed in mains and branches to design water flows.
    - a. Measure flow in main and branch pipes.
    - b. Adjust main and branch balance valves for design flow.
    - c. Re-measure each main and branch after all have been adjusted.
  5. Adjust flow-measuring devices installed at terminals for each space to design water flows.





- a. Measure flow at terminals.
- b. Adjust each terminal to design flow.
- c. Re-measure each terminal after it is adjusted.
- d. Position control valves to bypass the coil, and adjust the bypass valve to maintain design flow.
- e. Perform temperature tests after flows have been balanced.
6. For systems with pressure-independent valves at terminals:
  - a. Measure differential pressure, and verify that it is within manufacturer's specified range.
  - b. Perform temperature tests after flows have been verified.
7. For systems without pressure-independent valves or flow-measuring devices at terminals:
  - a. Measure and balance coils by either coil pressure drop or temperature method.
  - b. If balanced by coil pressure drop, perform temperature tests after flows have been verified.
8. Open control valves that were shut. Close a sufficient number of control valves that were previously open to maintain diversity, and balance terminals that were just opened.
9. Prior to verifying final system conditions, determine system differential-pressure set point.
10. If the pump discharge valve was used to set total system flow with variable-frequency controller at 60 Hz, at completion open discharge valve 100 percent and allow variable-frequency controller to control system differential-pressure set point. Record pump data under both conditions.
11. Mark final settings and verify that memory stops have been set.
12. Verify final system conditions as follows:
  - a. Re-measure and confirm that total water flow is within design.
  - b. Re-measure final pumps' operating data, TDH, volts, amps, and static profile.
  - c. Mark final settings.
13. Verify that memory stops have been set.

### 3.9 PROCEDURES FOR CONDENSING UNITS

- A. Verify proper rotation of fans.
- B. Measure entering- and leaving-air temperatures.
- C. Record fan and motor operating data.

### 3.10 SOUND TESTS

- A. After the systems are balanced and construction is Substantially Complete, measure and record sound levels at 5 locations as designated by the City.
- B. Instrumentation:
  1. The sound-testing meter shall be a portable, general-purpose testing meter consisting of a microphone, processing unit, and readout.
  2. The sound-testing meter shall be capable of showing fluctuations at minimum and maximum levels, and measuring the equivalent continuous sound pressure level (LEQ).
  3. The sound-testing meter must be capable of using 1/3 octave band filters to measure mid-frequencies from 31.5 Hz to 8000 Hz.
  4. The accuracy of the sound-testing meter shall be plus or minus one decibel.



C. Test Procedures:

1. Perform test at quietest background noise period. Note cause of unpreventable sound that affects test outcome.
2. Equipment should be operating at design values.
3. Calibrate the sound-testing meter prior to taking measurements.
4. Use a microphone suitable for the type of noise levels measured that is compatible with meter. Provide a windshield for outside or in-duct measurements.
5. Record a set of background measurements in dBA and sound pressure levels in the eight un-weighted octave bands 63 Hz to 8000 Hz (NC) with the equipment off.
6. Take sound readings in dBA and sound pressure levels in the eight un-weighted octave bands 63 Hz to 8000 Hz (NC) with the equipment operating.
7. Take readings no closer than 36 inches from a wall or from the operating equipment and approximately 60 inches from the floor, with the meter held or mounted on a tripod.
8. For outdoor measurements, move sound-testing meter slowly and scan area that has the most exposure to noise source being tested. Use A-weighted scale for this type of reading.

D. Reporting:

1. Report shall record the following:
  - a. Location.
  - b. System tested.
  - c. dBA reading.
  - d. Sound pressure level in each octave band with equipment on and off.
2. Plot sound pressure levels on NC worksheet with equipment on and off.

3.11 VIBRATION TESTS

A. After systems are balanced and construction is Substantially Complete, measure and record vibration levels on equipment having motor horsepower equal to or greater than 10.

B. Instrumentation:

1. Use portable, battery-operated, and microprocessor-controlled vibration meter with or without a built-in printer.
2. The meter shall automatically identify engineering units, filter bandwidth, amplitude, and frequency scale values.
3. The meter shall be able to measure machine vibration displacement in mils of deflection, velocity in inches per second, and acceleration in inches per second squared.
4. Verify calibration date is current for vibration meter before taking readings.

C. Test Procedures:

1. To ensure accurate readings, verify that accelerometer has a clean, flat surface and is mounted properly.
2. With the unit running, set up vibration meter in a safe, secure location. Connect transducer to meter with proper cables. Hold magnetic tip of transducer on top of the bearing, and measure unit in mils of deflection. Record measurement, then move transducer to the side of the bearing and record in mils of deflection. Record an axial reading in mils of deflection by holding nonmagnetic, pointed transducer tip on end of shaft.
3. Change vibration meter to velocity (inches per second) measurements. Repeat and record above measurements.
4. Record CPM or rpm.



5. Read each bearing on motor, fan, and pump as required. Track and record vibration levels from rotating component through casing to base.

D. Reporting:

1. Report shall record location and the system tested.
2. Include horizontal-vertical-axial measurements for tests.
3. Verify that vibration limits follow Specifications, or, if not specified, follow the General Machinery Vibration Severity Chart or Vibration Acceleration General Severity Chart from the AABC National Standards. Acceptable levels of vibration are normally "smooth" to "good."
4. Include in report General Machinery Vibration Severity Chart, with conditions plotted.

3.12 DUCT LEAKAGE TESTS

- A. Witness the duct pressure testing performed by Installer.
- B. Verify that proper test methods are used and that leakage rates are within specified tolerances.
- C. Report deficiencies observed.

3.13 CONTROLS VERIFICATION

- A. In conjunction with system balancing, perform the following:
  1. Verify temperature control system is operating within the design limitations.
  2. Confirm that the sequences of operation are in compliance with Contract Documents.
  3. Verify that controllers are calibrated and function as intended.
  4. Verify that controller set points are as indicated.
  5. Verify the operation of lockout or interlock systems.
  6. Verify the operation of valve and damper actuators.
  7. Verify that controlled devices are properly installed and connected to correct controller.
  8. Verify that controlled devices travel freely and are in position indicated by controller: open, closed, or modulating.
  9. Verify location and installation of sensors to ensure that they sense only intended temperature, humidity, or pressure.
- B. Reporting: Include a summary of verifications performed, remaining deficiencies, and variations from indicated conditions.

3.14 TOLERANCES

- A. Set HVAC system's airflow rates and water flow rates within the following tolerances:
  1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
  2. Air Outlets and Inlets: Plus or minus 10 percent.
- B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.



**3.15 PROGRESS REPORTING**

- A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, 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.
- B. Status Reports: Prepare weekly progress 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. Prepare a separate report for each system and each building floor for systems serving multiple floors.

**3.16 FINAL REPORT**

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
  - 1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
  - 2. Include a list of instruments used for procedures, along with proof of calibration.
  - 3. Certify validity and accuracy of field data.
- B. Final Report Contents: In addition to certified field-report data, include the following:
  - 1. Pump curves.
  - 2. Fan curves.
  - 3. Manufacturers' test data.
  - 4. Field test reports prepared by system and equipment installers.
  - 5. Other information relative to equipment performance; do not include Shop Drawings and Product Data.
- C. General Report Data: In addition to form titles and entries, include the following data:
  - 1. Title page.
  - 2. Name and address of the TAB specialist.
  - 3. Project name.
  - 4. Project location.
  - 5. Architect's name and address.
  - 6. Engineer's name and address.
  - 7. Contractor's name and address.
  - 8. Report date.
  - 9. Signature of TAB supervisor who certifies the report.
  - 10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
  - 11. Summary of contents including the following:
    - a. Indicated versus final performance.
    - b. Notable characteristics of systems.
    - c. Description of system operation sequence if it varies from the Contract Documents.
  - 12. Nomenclature sheets for each item of equipment.
  - 13. Data for terminal units, including manufacturer's name, type, size, and fittings.
  - 14. Notes to explain why certain final data in the body of reports vary from indicated values.
  - 15. Test conditions for fans and pump performance forms including the following:



- a. Settings for outdoor-, return-, and exhaust-air dampers.
  - b. Conditions of filters.
  - c. Cooling coil, wet- and dry-bulb conditions.
  - d. Face and bypass damper settings at coils.
  - e. Fan drive settings including settings and percentage of maximum pitch diameter.
  - f. Inlet vane settings for variable-air-volume systems.
  - g. Settings for supply-air, static-pressure controller.
  - h. Other system operating conditions that affect performance.
- D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:
1. Quantities of outdoor, supply, return, and exhaust airflows.
  2. Water and steam flow rates.
  3. Duct, outlet, and inlet sizes.
  4. Pipe and valve sizes and locations.
  5. Terminal units.
  6. Balancing stations.
  7. Position of balancing devices.
- E. Electric-Coil Test Reports: For electric furnaces, duct coils, and electric coils installed in central-station air-handling units, include the following:
1. Unit Data:
    - a. System identification.
    - b. Location.
    - c. Coil identification.
    - d. Capacity in Btu/h.
    - e. Number of stages.
    - f. Connected volts, phase, and hertz.
    - g. Rated amperage.
    - h. Airflow rate in cfm.
    - i. Face area in sq. ft..
    - j. Minimum face velocity in fpm.
  2. Test Data (Indicated and Actual Values):
    - a. Heat output in Btu/h.
    - b. Airflow rate in cfm.
    - c. Air velocity in fpm.
    - d. Entering-air temperature in deg F.
    - e. Leaving-air temperature in deg F.
    - f. Voltage at each connection.
    - g. Amperage for each phase.
- F. Fan Test Reports: For supply, return, and exhaust fans, include the following:
1. Fan Data:
    - a. System identification.
    - b. Location.
    - c. Make and type.
    - d. Model number and size.
    - e. Manufacturer's serial number.
    - f. Arrangement and class.
    - g. Sheave make, size in inches, and bore.
    - h. Center-to-center dimensions of sheave and amount of adjustments in inches.



2. Motor Data:
    - a. Motor make, and frame type and size.
    - b. Horsepower and rpm.
    - c. Volts, phase, and hertz.
    - d. Full-load amperage and service factor.
    - e. Sheave make, size in inches, and bore.
    - f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
    - g. Number, make, and size of belts.
  3. Test Data (Indicated and Actual Values):
    - a. Total airflow rate in cfm.
    - b. Total system static pressure in inches wg.
    - c. Fan rpm.
    - d. Discharge static pressure in inches wg.
    - e. Suction static pressure in inches wg.
- G. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:
1. Report Data:
    - a. System and air-handling-unit number.
    - b. Location and zone.
    - c. Traverse air temperature in deg F.
    - d. Duct static pressure in inches wg.
    - e. Duct size in inches.
    - f. Duct area in sq. ft..
    - g. Indicated airflow rate in cfm.
    - h. Indicated velocity in fpm.
    - i. Actual airflow rate in cfm.
    - j. Actual average velocity in fpm.
    - k. Barometric pressure in psig.
- H. Air-Terminal-Device Reports:
1. Unit Data:
    - a. System and air-handling unit identification.
    - b. Location and zone.
    - c. Apparatus used for test.
    - d. Area served.
    - e. Make.
    - f. Number from system diagram.
    - g. Type and model number.
    - h. Size.
    - i. Effective area in sq. ft..
  2. Test Data (Indicated and Actual Values):
    - a. Airflow rate in cfm.
    - b. Air velocity in fpm.
    - c. Preliminary airflow rate as needed in cfm.
    - d. Preliminary velocity as needed in fpm.
    - e. Final airflow rate in cfm.
    - f. Final velocity in fpm.
    - g. Space temperature in deg F.
- I. System-Coil Reports: For reheat coils and water coils of terminal units, include the following:



1. Unit Data:
  - a. System and air-handling-unit identification.
  - b. Location and zone.
  - c. Room or riser served.
  - d. Coil make and size.
  - e. Flowmeter type.
2. Test Data (Indicated and Actual Values):
  - a. Airflow rate in cfm.
  - b. Entering-water temperature in deg F.
  - c. Leaving-water temperature in deg F.
  - d. Water pressure drop in feet of head or psig.
  - e. Entering-air temperature in deg F.
  - f. Leaving-air temperature in deg F.

J. Instrument Calibration Reports:

1. Report Data:
  - a. Instrument type and make.
  - b. Serial number.
  - c. Application.
  - d. Dates of use.
  - e. Dates of calibration.

3.17 VERIFICATION OF TAB REPORT

- A. The TAB specialist's test and balance engineer shall conduct the inspection in the presence of the City's representative.
- B. The City shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
- C. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
- D. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.
- E. If TAB work fails, proceed as follows:
  1. TAB specialists shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
  2. If the second final inspection also fails, the City may contract the services of another TAB specialist to complete TAB work according to the Contract Documents and deduct the cost of the services from the original TAB specialist's final payment.
- F. Prepare test and inspection reports.

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## SECTION 23 07 13 - DUCT INSULATION

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section includes insulating the following duct services:
  - 1. Indoor, concealed supply and outdoor air.
  - 2. Indoor, concealed return located in unconditioned space.
  - 3. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
- B. Related Sections:
  - 1. Section 230719 "HVAC Piping Insulation."

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied if any).
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
  - 1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
  - 2. Detail insulation application at elbows, fittings, dampers, specialties and flanges for each type of insulation.
  - 3. Detail application of field-applied jackets.
  - 4. Detail application at linkages of control devices.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. 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 and test methods employed.
- C. Field quality-control reports.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.



- B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
  - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
  - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

#### 1.7 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."
- B. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.
- C. Coordinate installation and testing of heat tracing.

#### 1.8 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

### PART 2 - PRODUCTS

#### 2.1 INSULATION MATERIALS

- A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.



- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. CertainTeed Corp.; SoftTouch Duct Wrap.
    - b. Knauf Insulation; Friendly Feel Duct Wrap.
    - c. Owens Corning; SOFTR All-Service Duct Wrap.

2.2 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- B. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Aeroflex USA, Inc.; Aero seal.
    - b. Armacell LLC; Armaflex 520 Adhesive.
    - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-75.
  - 2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.
    - b. Eagle Bridges - Marathon Industries; 225.
    - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-03/11-70.
  - 2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- D. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.



- b. Eagle Bridges - Marathon Industries; 225.
- c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-50.
- 2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- 3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

### 2.3 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
  - 1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-03/11-90.
    - b. Vimasco Corporation; 749.
  - 2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
  - 3. Service Temperature Range: Minus 20 to plus 180 deg F.
  - 4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
  - 1. Verify that systems to be insulated have been tested and are free of defects.
  - 2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

### 3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.
- B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.



- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Keep insulation materials dry during application and finishing.
- G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- H. Install insulation with least number of joints practical.
- I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
  - 1. Install insulation continuously through hangers and around anchor attachments.
  - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
  - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
- J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- K. Install insulation with factory-applied jackets as follows:
  - 1. Draw jacket tight and smooth.
  - 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
  - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches O.c.
    - a. For below ambient services, apply vapor-barrier mastic over staples.
  - 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
  - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.
- L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.



### 3.4 PENETRATIONS

- A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated):  
Install insulation continuously through walls and partitions.
- B. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.

### 3.5 FIRE-RATED INSULATION SYSTEM INSTALLATION

- A. Where fire-rated insulation system is indicated, secure system to ducts and duct hangers and supports to maintain a continuous fire rating.
- B. Insulate duct access panels and doors to achieve same fire rating as duct.
- C. Install firestopping at penetrations through fire-rated assemblies. Fire-stop systems are specified in Section 078413 "Penetration Firestopping."

### 3.6 FINISHES

- A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
  - 1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
    - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Color: Final color as selected by City. Vary first and second coats to allow visual inspection of the completed Work.
- C. Do not field paint aluminum or stainless-steel jackets.

### 3.7 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Tests and Inspections:
  - 1. Inspect ductwork, randomly selected by City, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.
- C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

### 3.8 DUCT INSULATION SCHEDULE, GENERAL

- A. Plenums and Ducts Requiring Insulation:
  - 1. Indoor, concealed supply and outdoor air.
  - 2. Indoor, concealed return located in unconditioned space.



3. Indoor, concealed exhaust between isolation damper and penetration of building exterior.

**3.9 INDOOR DUCT AND PLENUM INSULATION SCHEDULE**

- A. Concealed, round and flat-oval, supply-air duct insulation shall be the following:
  1. Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. ft. nominal density.
- B. Concealed, round and flat-oval, return-air duct insulation shall be the following:
  1. Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. ft. nominal density.
- C. Concealed, round and flat-oval, outdoor-air duct insulation shall be the following:
  1. Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. ft. nominal density.
- D. Concealed, round and flat-oval, exhaust-air duct insulation shall be the following:
  1. Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. ft. nominal density.
- E. Concealed, rectangular, supply-air duct insulation shall be the following:
  1. Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. ft. nominal density.
- F. Concealed, rectangular, return-air duct insulation shall be one of the following:
  1. Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. ft. nominal density.
- G. Concealed, rectangular, outdoor-air duct insulation shall be the following:
  1. Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. ft. nominal density.

**END OF SECTION 23 07 13**



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## SECTION 23 07 19 - HVAC PIPING INSULATION

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section includes insulating the following HVAC piping systems:
  - 1. Steam and steam condensate piping.
  - 2. Dual-service heating and cooling piping.

#### 1.3 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

#### 1.4 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."
- B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.
- C. Coordinate installation and testing of heat tracing.

#### 1.5 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.



## PART 2 - PRODUCTS

### 2.1 INSULATION MATERIALS

- A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.
- B. Available manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the Work include, but are not limited to, the following:
  - 1. Armacell
  - 2. CertainTeed Corp.
  - 3. Knauf Fiber Glass GmbH
  - 4. Johns Manville Corp.
  - 5. Owens-Corning Corp.
  - 6. RBX Industries.
- C. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- D. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- E. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- F. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process. Closed cell. K-value of 0.27 or less at 75°F (39 or less at 24°C) mean temperature. Maximum vapor permeance of 0.08 perms. Meet 25 flame / 50 smoke rating for thicknesses up to 1.5 inch. Insulation must be CFC free.
- G. Pipe sizes up to 6": Preformed, one-piece insulation. Armacell AP/Armaflex, Rubatex Insul-Tube 180, or approved equal.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
  - 1. Verify that systems to be insulated have been tested and are free of defects.
  - 2. Verify that surfaces to be insulated are clean and dry.
  - 3. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.



- B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
  - 1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
  - 2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
- C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

### 3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
  - 1. Install insulation continuously through hangers and around anchor attachments.
  - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.



3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
  4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
1. Draw jacket tight and smooth.
  2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
  3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
    - a. For below-ambient services, apply vapor-barrier mastic over staples.
  4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
  5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. For above-ambient services, do not install insulation to the following:
1. Vibration-control devices.
  2. Testing agency labels and stamps.
  3. Nameplates and data plates.
  4. Manholes.
  5. Handholes.
  6. Cleanouts.

### 3.4 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.



**B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:**

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
  2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
  3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
  4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
  5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
  6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
  7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
  8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
  9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.**
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:**



1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

### 3.5 FINISHES

- A. Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
  1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
    - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Color: Final color as selected by City. Vary first and second coats to allow visual inspection of the completed Work.
- C. Do not field paint aluminum or stainless-steel jackets.

### 3.6 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
  1. Drainage piping located in crawl spaces.
  2. Underground piping.
  3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.
- C. Insulation thicknesses (inch / mm) for system type and pipe diameters per following table based on specified K factor. Comply with California Title 24 as a minimum, unless a more stringent requirement is specified.



Insulation Thickness Schedule						
Piping System	Runouts up to 2"	3/4" to 1"	1-1/2" to 2"	2-1/2" to 4"	5" to 6"	8" and greater
Refrigerant	1"	1"	1-1/2"	1-1/2"	1-1/2"	1-1/2"

**END OF SECTION 23 07 19**



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## SECTION 23 23 00 - REFRIGERANT PIPING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Refrigerant pipes and fittings.
  - 2. Refrigerant piping valves and specialties.
  - 3. Refrigerants.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of valve and refrigerant piping specialty.
  - 1. Include pressure drop, based on manufacturer's test data, for the following:
    - a. Thermostatic expansion valves.
    - b. Solenoid valves.
    - c. Hot-gas bypass valves.
    - d. Filter dryers.
    - e. Strainers.
    - f. Pressure-regulating valves.
- B. Shop Drawings:
  - 1. Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes; flow capacities; valve arrangements and locations; slopes of horizontal runs; oil traps; double risers; wall and floor penetrations; and equipment connection details.
  - 2. Show piping size and piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.
  - 3. Show interface and spatial relationships between piping and equipment.
  - 4. Shop Drawing Scale: 1/4 inch equals 1 foot.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

#### 1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to 2010 ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
- B. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."



C. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.6 PRODUCT STORAGE AND HANDLING

A. Store piping with end caps in place to ensure that piping interior and exterior are clean when installed.

**PART 2 - PRODUCTS**

2.1 PERFORMANCE REQUIREMENTS

- A. Line Test Pressure for Refrigerant R-410A:
  - 1. Suction Lines for Air-Conditioning Applications: 300 psig.
  - 2. Suction Lines for Heat-Pump Applications: 535 psig.
  - 3. Hot-Gas and Liquid Lines: 535 psig.

2.2 COPPER TUBE AND FITTINGS

- A. Copper Tube: ASTM B 88, Type K or L.
- B. Wrought-Copper Fittings: ASME B16.22.
- C. Wrought-Copper Unions: ASME B16.22.
- D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.
- E. Brazing Filler Metals: AWS A5.8/A5.8M.
- F. Flexible Connectors:
  - 1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
  - 2. End Connections: Socket ends.
  - 3. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch-long assembly.
  - 4. Working Pressure Rating: Factory test at minimum 500 psig.
  - 5. Maximum Operating Temperature: 250 deg F.

2.3 VALVES AND SPECIALTIES

- A. Check Valves:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Danfoss Inc.
    - b. Emerson Climate Technologies.
    - c. Heldon Products; Henry Technologies.
  - 3. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
  - 4. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.





5. Piston: Removable polytetrafluoroethylene seat.
  6. Closing Spring: Stainless steel.
  7. Manual Opening Stem: Seal cap, plated-steel stem, and graphite seal.
  8. End Connections: Socket, union, threaded, or flanged.
  9. Maximum Opening Pressure: 0.50 psig.
  10. Working Pressure Rating: 500 psig.
  11. Maximum Operating Temperature: 275 deg F.
- B. Service Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Danfoss Inc.
    - b. Emerson Climate Technologies.
    - c. Heldon Products; Henry Technologies.
  3. Body: Forged brass with brass cap including key end to remove core.
  4. Core: Removable ball-type check valve with stainless-steel spring.
  5. Seat: Polytetrafluoroethylene.
  6. End Connections: Copper spring.
  7. Working Pressure Rating: 500 psig.
- C. Solenoid Valves: Comply with AHRI 760 and UL 429; listed and labeled by a National Recognized Testing Laboratory (NRTL).
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Danfoss Inc.
    - b. Emerson Climate Technologies.
    - c. Heldon Products; Henry Technologies.
  3. Body and Bonnet: Plated steel.
  4. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
  5. Seat: Polytetrafluoroethylene.
  6. End Connections: Threaded.
  7. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter, and 24 -V ac coil.
  8. Working Pressure Rating: 400 psig.
  9. Maximum Operating Temperature: 240 deg F.
- D. Safety Relief Valves: Comply with 2010 ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Danfoss Inc.
    - b. Heldon Products; Henry Technologies.
    - c. Parker Hannifin Corp.
  3. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.
  4. Piston, Closing Spring, and Seat Insert: Stainless steel.



5. Seat: Polytetrafluoroethylene.
  6. End Connections: Threaded.
  7. Working Pressure Rating: 400 psig.
  8. Maximum Operating Temperature: 240 deg F.
- E. Thermostatic Expansion Valves: Comply with AHRI 750.
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Danfoss Inc.
    - b. Emerson Climate Technologies.
    - c. Heldon Products; Henry Technologies.
  3. Body, Bonnet, and Seal Cap: Forged brass or steel.
  4. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
  5. Packing and Gaskets: Non-asbestos.
  6. Capillary and Bulb: Copper tubing filled with refrigerant charge.
  7. Suction Temperature: 40 deg F.
  8. Superheat: Adjustable.
  9. Reverse-flow option (for heat-pump applications).
  10. End Connections: Socket, flare, or threaded union.
  11. Working Pressure Rating: 700 psig.
- F. Hot-Gas Bypass Valves: Comply with UL 429; listed and labeled by an NRTL.
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Danfoss Inc.
    - b. Heldon Products; Henry Technologies.
    - c. Parker Hannifin Corp.
  3. Body, Bonnet, and Seal Cap: Ductile iron or steel.
  4. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
  5. Packing and Gaskets: Non-asbestos.
  6. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
  7. Seat: Polytetrafluoroethylene.
  8. Equalizer: Internal.
  9. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter and 24 -V ac coil.
  10. End Connections: Socket.
  11. Throttling Range: Maximum 5 psig.
  12. Working Pressure Rating: 500 psig.
  13. Maximum Operating Temperature: 240 deg F.
- G. Angle-Type Strainers:
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Danfoss Inc.
    - b. Heldon Products; Henry Technologies.



- c. Parker Hannifin Corp.
  - 3. Body: Forged brass or cast bronze.
  - 4. Drain Plug: Brass hex plug.
  - 5. Screen: 100-mesh monel.
  - 6. End Connections: Socket or flare.
  - 7. Working Pressure Rating: 500 psig.
  - 8. Maximum Operating Temperature: 275 deg F.
- H. Moisture/Liquid Indicators:
- 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Danfoss Inc.
    - b. Emerson Climate Technologies.
    - c. Heldon Products; Henry Technologies.
  - 3. Body: Forged brass.
  - 4. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.
  - 5. Indicator: Color coded to show moisture content in parts per million (ppm).
  - 6. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.
  - 7. End Connections: Socket or flare.
  - 8. Working Pressure Rating: 500 psig.
  - 9. Maximum Operating Temperature: 240 deg F.
- I. Replaceable-Core Filter Dryers: Comply with AHRI 730.
- 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Danfoss Inc.
    - b. Emerson Climate Technologies.
    - c. Heldon Products; Henry Technologies.
  - 3. Body and Cover: Painted-steel shell with ductile-iron cover, stainless-steel screws, and neoprene gaskets.
  - 4. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
  - 5. Desiccant Media: Activated alumina.
  - 6. Designed for reverse flow (for heat-pump applications).
  - 7. End Connections: Socket.
  - 8. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.
  - 9. Maximum Pressure Loss: 2 psig.
  - 10. Working Pressure Rating: 500 psig.
  - 11. Maximum Operating Temperature: 240 deg F.

2.4 REFRIGERANTS

- A. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.



**PART 3 - EXECUTION**

**3.1 PIPING APPLICATIONS FOR REFRIGERANT R-410A**

- A. Suction Lines NPS 1-1/2 and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed or soldered joints.
- B. Suction Lines NPS 3-1/2 and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.
- C. Suction Lines NPS 4 and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with soldered joints.
- D. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.
- E. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type K, annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.
- F. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with 95-5 tin-antimony soldered joints.
- G. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with Alloy HB soldered joints.
- H. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications:
  - 1. NPS 1-1/4 and Smaller: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with 95-5 tin-antimony soldered joints.
- I. Safety-Relief-Valve Discharge Piping: Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.
- J. Safety-Relief-Valve Discharge Piping:
  - 1. NPS 1-1/4 and Smaller: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with 95-5 tin-antimony soldered joints.

**3.2 VALVE AND SPECIALTY APPLICATIONS**

- A. Install valves in suction and discharge lines of compressor.
- B. Install service valves for gage taps at inlet and outlet of hot-gas bypass valves and strainers if they are not an integral part of valves and strainers.
- C. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection.
- D. Except as otherwise indicated, install valves on inlet and outlet side of filter dryers.





- E. Install a full-size, three-valve bypass around filter dryers.
- F. Install solenoid valves upstream from each expansion valve and hot-gas bypass valve. Install solenoid valves in horizontal lines with coil at top.
- G. Install thermostatic expansion valves as close as possible to distributors on evaporators.
  - 1. Install valve so diaphragm case is warmer than bulb.
  - 2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.
  - 3. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.
- H. Install safety relief valves where required by 2010 ASME Boiler and Pressure Vessel Code. Pipe safety-relief-valve discharge line to outside according to ASHRAE 15.
- I. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.
- J. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for the device being protected:
  - 1. Solenoid valves.
  - 2. Thermostatic expansion valves.
  - 3. Hot-gas bypass valves.
  - 4. Compressor.
- K. Install filter dryers in liquid line between compressor and thermostatic expansion valve, and in the suction line at the compressor.
- L. Install receivers sized to accommodate pump-down charge.
- M. Install flexible connectors at compressors.

### 3.3 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.
- B. Install refrigerant piping according to ASHRAE 15.
- C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping adjacent to machines to allow service and maintenance.





- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Select system components with pressure rating equal to or greater than system operating pressure.
- J. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.
- K. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Section 08 31 13 "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.
- L. Install refrigerant piping in protective conduit where installed belowground.
- M. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.
- N. Slope refrigerant piping as follows:
  - 1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
  - 2. Install horizontal suction lines with a uniform slope downward to compressor.
  - 3. Install traps and double risers to entrain oil in vertical runs.
  - 4. Liquid lines may be installed level.
- O. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.
- P. Before installation of steel refrigerant piping, clean pipe and fittings using the following procedures:
  - 1. Shot blast the interior of piping.
  - 2. Remove coarse particles of dirt and dust by drawing a clean, lintless cloth through tubing by means of a wire or electrician's tape.
  - 3. Draw a clean, lintless cloth saturated with trichloroethylene through the tube or pipe. Continue this procedure until cloth is not discolored by dirt.
  - 4. Draw a clean, lintless cloth, saturated with compressor oil, squeezed dry, through the tube or pipe to remove remaining lint. Inspect tube or pipe visually for remaining dirt and lint.
  - 5. Finally, draw a clean, dry, lintless cloth through the tube or pipe.
  - 6. Safety-relief-valve discharge piping is not required to be cleaned but is required to be open to allow unrestricted flow.
- Q. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.
- R. Identify refrigerant piping and valves according to Section 23 05 53 "Identification for HVAC Piping and Equipment."





- S. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 23 05 17 "Sleeves and Sleeve Seals for HVAC Piping."
- T. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 23 05 17 "Sleeves and Sleeve Seals for HVAC Piping."
- U. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 23 05 18 "Escutcheons for HVAC Piping."

3.4 PIPE JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."
- D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
  - 1. Use Type BCuP (copper-phosphorus) alloy for joining copper socket fittings with copper pipe.
  - 2. Use Type BAg (cadmium-free silver) alloy for joining copper with bronze or steel.
- E. Threaded Joints: Thread steel pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and to restore full ID. Join pipe fittings and valves as follows:
  - 1. Apply appropriate tape or thread compound to external pipe threads unless dry-seal threading is specified.
  - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- F. Steel pipe can be threaded, but threaded joints must be seal brazed or seal welded.
- G. Welded Joints: Construct joints according to AWS D10.12M/D10.12.
- H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.5 HANGERS AND SUPPORTS

- A. Comply with requirements for pipe hangers and supports specified in Section 23 05 29 "Hangers and Supports for HVAC Piping and Equipment."
- B. Install the following pipe attachments:
  - 1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
  - 2. Roller hangers and spring hangers for individual horizontal runs 20 feet or longer.



- 3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
- 4. Spring hangers to support vertical runs.
- 5. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
  
- C. Install hangers for copper tubing with the following maximum spacing and minimum rod diameters:
  - 1. NPS 1/2: Maximum span, 60 inches; minimum rod, 1/4 inch.
  - 2. NPS 5/8: Maximum span, 60 inches; minimum rod, 1/4 inch.
  - 3. NPS 1: Maximum span, 72 inches; minimum rod, 1/4 inch.
  - 4. NPS 1-1/4: Maximum span, 96 inches; minimum rod, 3/8 inch.
  - 5. NPS 1-1/2: Maximum span, 96 inches; minimum rod, 3/8 inch.
  - 6. NPS 2: Maximum span, 96 inches; minimum rod, 3/8 inch.
  - 7. NPS 2-1/2: Maximum span, 108 inches; minimum rod, 3/8 inch.
  - 8. NPS 3: Maximum span, 10 feet; minimum rod, 3/8 inch.
  - 9. NPS 4: Maximum span, 12 feet; minimum rod, 1/2 inch.
  
- D. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 2: Maximum span, 10 feet; minimum rod, 3/8 inch.
  - 2. NPS 2-1/2: Maximum span, 11 feet; minimum rod, 3/8 inch.
  - 3. NPS 3: Maximum span, 12 feet; minimum rod, 3/8 inch.
  - 4. NPS 4: Maximum span, 14 feet; minimum rod, 1/2 inch.
  
- E. Support multifloor vertical runs at least at each floor.

3.6 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
  - 1. Comply with ASME B31.5, Chapter VI.
  - 2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
  - 3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in "Performance Requirements" Article.
    - a. Fill system with nitrogen to the required test pressure.
    - b. System shall maintain test pressure at the manifold gage throughout duration of test.
    - c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
    - d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.
  
- B. Prepare test and inspection reports.

3.7 SYSTEM CHARGING

- A. Charge system using the following procedures:
  - 1. Install core in filter dryers after leak test but before evacuation.
  - 2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.



3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
  4. Charge system with a new filter-dryer core in charging line.
- 3.8 ADJUSTING
- A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.
  - B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.
  - C. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.
  - D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:
    1. Open shutoff valves in condenser water circuit.
    2. Verify that compressor oil level is correct.
    3. Open compressor suction and discharge valves.
    4. Open refrigerant valves except bypass valves that are used for other purposes.
    5. Check open compressor-motor alignment and verify lubrication for motors and bearings.
  - E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

**END OF SECTION 23 23 00**



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## SECTION 23 31 13 - METAL DUCTS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Single-wall rectangular ducts and fittings.
  - 2. Single-wall round and flat-oval ducts and fittings.
  - 3. Double-wall round ducts and fittings.
  - 4. Sheet metal materials.
  - 5. Sealants and gaskets.
  - 6. Hangers and supports.
  - 7. Seismic-restraint devices.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Duct hangers and supports and seismic restraints shall withstand the effects of gravity and seismic loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems."
  - 1. Seismic Hazard Level A: Seismic force to weight ratio, 0.48.
  - 2. Seismic Hazard Level B: Seismic force to weight ratio, 0.30.
  - 3. Seismic Hazard Level C: Seismic force to weight ratio, 0.15.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of the following products:
  - 1. Sealants and gaskets.
  - 2. Seismic-restraint devices.
- B. Shop Drawings:
  - 1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
  - 2. Factory- and shop-fabricated ducts and fittings.
  - 3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
  - 4. Elevation of top of ducts.
  - 5. Dimensions of main duct runs from building grid lines.
  - 6. Fittings.
  - 7. Reinforcement and spacing.
  - 8. Seam and joint construction.
  - 9. Penetrations through fire-rated and other partitions.
  - 10. Equipment installation based on equipment being used on Project.



- 11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
- 12. Hangers and supports, including methods for duct and building attachment, seismic restraints, and vibration isolation.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
  - 1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
  - 2. Suspended ceiling components.
  - 3. Structural members to which duct will be attached.
  - 4. Size and location of initial access modules for acoustical tile.
  - 5. Penetrations of smoke barriers and fire-rated construction.
  - 6. Items penetrating finished ceiling including the following:
    - a. Lighting fixtures.
    - b. Air outlets and inlets.
    - c. Speakers.
    - d. Sprinklers.
    - e. Access panels.
    - f. Perimeter moldings.

**PART 2 - PRODUCTS**

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."





2.2 SINGLE-WALL ROUND AND FLAT-OVAL DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
- B. Flat-Oval Ducts: Indicated dimensions are the duct width (major dimension) and diameter of the round sides connecting the flat portions of the duct (minor dimension).
- C. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- E. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 DOUBLE-WALL ROUND AND FLAT-OVAL DUCTS AND FITTINGS

- A. Flat-Oval Ducts: Indicated dimensions are the duct width (major dimension) and diameter of the round sides connecting the flat portions of the duct (minor dimension) of the inner duct.
- B. Outer Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on static-pressure class unless otherwise indicated.
  - 1. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
  - 2. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
  - 3. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."



- C. Inner Duct: Minimum 0.028-inch solid sheet steel.

#### 2.4 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
  - 1. Galvanized Coating Designation: G90.
- C. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
  - 1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.
- D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

#### 2.5 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
- B. Water-Based Joint and Seam Sealant:
  - 1. Application Method: Brush on.
  - 2. Solids Content: Minimum 65 percent.
  - 3. Shore A Hardness: Minimum 20.
  - 4. Water resistant.
  - 5. Mold and mildew resistant.
  - 6. VOC: Maximum 75 g/L (less water).
  - 7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
  - 8. Service: Indoor or outdoor.
  - 9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

#### 2.6 HANGERS AND SUPPORTS

- A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.
- B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
- C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."





- D. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- E. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

## 2.7 SEISMIC-RESTRAINT DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Cooper B-Line, Inc.; a division of Cooper Industries.
  - 2. Kinetics Noise Control, Inc.
  - 3. Mason Industries, Inc.
- B. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by an agency acceptable to authorities having jurisdiction.
  - 1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.
- C. Channel Support System: Shop- or field-fabricated support assembly made of slotted steel channels rated in tension, compression, and torsion forces and with accessories for attachment to braced component at one end and to building structure at the other end. Include matching components and corrosion-resistant coating.
- D. Restraint Cables: ASTM A 603, galvanized -steel cables with end connections made of cadmium-plated steel assemblies with brackets, swivel, and bolts designed for restraining cable service; and with an automatic-locking and clamping device or double-cable clips.
- E. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.
- F. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

## PART 3 - EXECUTION

### 3.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.
- B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. Install round and flat-oval ducts in maximum practical lengths.



- D. Install ducts with fewest possible joints.
- E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
- K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Section 233300 "Air Duct Accessories" for fire and smoke dampers.
- L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

### 3.2 INSTALLATION OF EXPOSED DUCTWORK

- A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.
- B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.
- C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.
- D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.
- E. Repair or replace damaged sections and finished work that does not comply with these requirements.

### 3.3 DUCT SEALING

- A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."



### 3.4 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."
- B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
  - 1. Where practical, install concrete inserts before placing concrete.
  - 2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
  - 3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
  - 4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
  - 5. Do not use powder-actuated concrete fasteners for seismic restraints.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
- D. Hangers Exposed to View: Threaded rod and angle or channel supports.
- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.
- F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

### 3.5 SEISMIC-RESTRAINT-DEVICE INSTALLATION

- A. Install ducts with hangers and braces designed to support the duct and to restrain against seismic forces required by applicable building codes. Comply with SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems."
  - 1. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
  - 2. Brace a change of direction longer than 12 feet.
- B. Select seismic-restraint devices with capacities adequate to carry present and future static and seismic loads.
- C. Install cables so they do not bend across edges of adjacent equipment or building structure.
- D. Install cable restraints on ducts that are suspended with vibration isolators.
- E. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction.
- F. Attachment to Structure: If specific attachment is not indicated, anchor bracing and restraints to structure, to flanges of beams, to upper truss chords of bar joists, or to concrete members.



G. Drilling for and Setting Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcement or embedded items during drilling. Notify the City if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Set anchors to manufacturer's recommended torque, using a torque wrench.
5. Install zinc-coated steel anchors for interior applications and stainless-steel anchors for applications exposed to weather.

3.6 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.7 PAINTING

- A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

3.8 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Leakage Tests:
  1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
  2. Test the following systems:
    - a. Supply Ducts with a Pressure Class of 2-Inch wg or Higher: Test representative duct sections totaling no less than 100 percent of total installed duct area for each designated pressure class.
    - b. Return Ducts with a Pressure Class of 2-Inch wg or Higher: Test representative duct sections, selected by City from sections installed, totaling no less than 100 percent of total installed duct area for each designated pressure class.
    - c. Exhaust Ducts with a Pressure Class of 2-Inch wg or Higher: Test representative duct sections, selected by City from sections installed, totaling no less than 100 percent of total installed duct area for each designated pressure class.
    - d. Outdoor Air Ducts with a Pressure Class of 2-Inch wg or Higher: Test representative duct sections, selected by City from sections installed, totaling no less than 100 percent of total installed duct area for each designated pressure class.



- 3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
  - 4. Test for leaks before applying external insulation.
  - 5. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.
  - 6. Give seven days' advance notice for testing.
- C. Duct System Cleanliness Tests:
- 1. Visually inspect duct system to ensure that no visible contaminants are present.
  - 2. Test sections of metal duct system, chosen randomly by the City, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."
    - a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.
- D. Duct system will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

3.9 START UP

- A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

3.10 DUCT SCHEDULE

- A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:
  - 1. Underground Ducts: Concrete-encased, .
  - 2. Insert requirements.
- B. Supply Ducts:
  - 1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units :
    - a. Pressure Class: Positive 2-inch wg.
    - b. Minimum SMACNA Seal Class: B.
    - c. SMACNA Leakage Class for Rectangular: 24.
    - d. SMACNA Leakage Class for Round and Flat Oval: 24.
- C. Return Ducts:
  - 1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units Insert equipment:
    - a. Pressure Class: Positive or negative 2-inch wg.
    - b. Minimum SMACNA Seal Class: B.
    - c. SMACNA Leakage Class for Rectangular: 24.
    - d. SMACNA Leakage Class for Round and Flat Oval: 24.
- D. Exhaust Ducts:
  - 1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:
    - a. Pressure Class: Negative 2-inch wg.
    - b. Minimum SMACNA Seal Class: B if negative pressure, and A if positive pressure.
    - c. SMACNA Leakage Class for Rectangular: 24.



- d. SMACNA Leakage Class for Round and Flat Oval: 24.
- E. Outdoor-Air (Not Filtered, Heated, or Cooled) Ducts:
  - 1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:
    - a. Pressure Class: Positive or negative 2-inch wg.
    - b. Minimum SMACNA Seal Class: B.
    - c. SMACNA Leakage Class for Rectangular: 24.
    - d. SMACNA Leakage Class for Round and Flat Oval: 12.

**END OF SECTION 23 31 13**



## SECTION 23 33 00 - AIR DUCT ACCESSORIES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Backdraft and pressure relief dampers.
  - 2. Manual volume dampers.
  - 3. Turning vanes.
  - 4. Duct accessory hardware.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. For duct silencers, include pressure drop and dynamic insertion loss data. Include breakout noise calculations for high transmission loss casings.
- B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.
  - 1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:
    - a. Manual volume damper installations.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted access panels and access doors required for access to duct accessories are shown and coordinated with each other, using input from Installers of the items involved.

#### 1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

### PART 2 - PRODUCTS

#### 2.1 ASSEMBLY DESCRIPTION

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."



- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

## 2.2 MATERIALS

- A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
  - 1. Galvanized Coating Designation: G90.
  - 2. Exposed-Surface Finish: Mill phosphatized.
- B. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304, and having a No. 2 finish for concealed ducts and finish for exposed ducts.
- C. Aluminum Sheets: Comply with ASTM B 209, Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.
- D. Extruded Aluminum: Comply with ASTM B 221, Alloy 6063, Temper T6.
- E. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- F. 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.

## 2.3 BACKDRAFT AND PRESSURE RELIEF DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - 1. Greenheck Fan Corporation.
  - 2. Lloyd Industries, Inc.
  - 3. Pottorff.
  - 4. Ruskin Company.
- C. Description: Gravity balanced.
- D. Maximum Air Velocity: 2000 fpm.
- E. Maximum System Pressure: 2-inch wg.
- F. Frame: Hat-shaped, 0.05-inch- thick, galvanized sheet steel, with welded corners or mechanically attached and mounting flange.
- G. Blades: Multiple single-piece blades, center pivoted, maximum 6-inch width, 0.025-inch-thick, roll-formed aluminum with sealed edges.
- H. Blade Action: Parallel.
- I. Blade Seals: Neoprene, mechanically locked.





- J. Blade Axles:
  - 1. Material: Galvanized steel .
  - 2. Diameter: 0.20 inch.
- K. Tie Bars and Brackets: Galvanized steel.
- L. Return Spring: Adjustable tension.
- M. Bearings: Steel ball.

#### 2.4 MANUAL VOLUME DAMPERS

- A. Standard, Steel, Manual Volume Dampers:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Nailor Industries Inc.
    - b. Pottorff.
    - c. Ruskin Company.
  - 3. Standard leakage rating
  - 4. Suitable for horizontal or vertical applications.
  - 5. Frames:
    - a. Frame: Hat-shaped, 0.094-inch- thick, galvanized sheet steel.
    - b. Mitered and welded corners.
    - c. Flanges for attaching to walls and flangeless frames for installing in ducts.
  - 6. Blade Axles: Galvanized steel.
  - 7. Bearings:
    - a. Oil-impregnated bronze.
    - b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
  - 8. Tie Bars and Brackets: Galvanized steel.
- B. Jackshaft:
  - 1. Size: 1-inch diameter.
  - 2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
  - 3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.
- C. Damper Hardware:
  - 1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch- thick zinc-plated steel, and a 3/4-inch hexagon locking nut.
  - 2. Include center hole to suit damper operating-rod size.
  - 3. Include elevated platform for insulated duct mounting.

#### 2.5 TURNING VANES

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:



- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - 1. Ductmate Industries, Inc.
  - 2. Duro Dyne Inc.
  - 3. METALAIRE, Inc.
- C. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
  - 1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.
- D. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vaness and Vane Runners," and 4-4, "Vane Support in Elbows."

**PART 3 - EXECUTION**

**3.1 INSTALLATION**

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.
- C. Install dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.
- D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
  - 1. Install steel volume dampers in steel ducts.
- E. Set dampers to fully open position before testing, adjusting, and balancing.
- F. Install test holes at fan inlets and outlets and elsewhere as indicated.

**3.2 FIELD QUALITY CONTROL**

- A. Tests and Inspections:
  - 1. Operate dampers to verify full range of movement.
  - 2. Inspect turning vanes for proper and secure installation.

**END OF SECTION 23 33 00**





## SECTION 23 34 16 - CENTRIFUGAL HVAC FANS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes: For each product.
  - 1. Forward-curved centrifugal fans.

#### 1.3 ACTION SUBMITTALS

- A. Product Data:
  - 1. Include rated capacities, furnished specialties, and accessories for each fan.
  - 2. Certified fan performance curves with system operating conditions indicated.
  - 3. Certified fan sound-power ratings.
  - 4. Motor ratings and electrical characteristics, plus motor and electrical accessories.
  - 5. Material thickness and finishes, including color charts.
  - 6. Dampers, including housings, linkages, and operators.
- B. Shop Drawings:
  - 1. Include plans, elevations, sections, and attachment details.
  - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 3. Include diagrams for power, signal, and control wiring.
  - 4. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
  - 5. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, and base weights.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For centrifugal fans to include in emergency, operation, and maintenance manuals.

#### 1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Belts: One set(s) for each belt-driven unit.



## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. AMCA Compliance:
  - 1. Comply with AMCA performance requirements and bear the AMCA-Certified Ratings Seal.
  - 2. Operating Limits: Classify according to AMCA 99.
- B. Unusual Service Conditions:
  - 1. High humidity.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

### 2.2 FORWARD-CURVED CENTRIFUGAL FANS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or a comparable product by one of the following:
  - 1. Greenheck.
  - 2. Cook.
- C. Description:
  - 1. Factory-fabricated, -assembled, -tested, and -finished, belt-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor, drive assembly, and support structure.
  - 2. Deliver fans as factory-assembled units, to the extent allowable by shipping limitations.
  - 3. Factory-installed and -wired disconnect switch.
- D. Housings:
  - 1. Formed panels to make curved-scroll housings with shaped cutoff.
  - 2. Panel Bracing: Steel angle- or channel-iron member supports for mounting and supporting fan scroll, wheel, motor, and accessories.
  - 3. Horizontally split, bolted-flange housing.
  - 4. Spun inlet cone with flange.
  - 5. Outlet flange.
- E. Forward-Curved Wheels:
  - 1. Black-enameled or galvanized-steel construction with inlet flange, backplate, shallow blades with inlet and tip curved forward in direction of airflow.
  - 2. Mechanically secured to flange and backplate; cast-steel hub swaged to backplate and fastened to shaft with set screws.
- F. Shafts:
  - 1. Statically and dynamically balanced and selected for continuous operation at maximum rated fan speed and motor horsepower, with adjustable alignment and belt tensioning.
  - 2. Turned, ground, and polished hot-rolled steel with keyway. Ship with protective coating of lubricating oil.



- 3. Designed to operate at no more than 70 percent of first critical speed at top of fan's speed range.
- G. Belt Drives:
  - 1. Factory mounted, with adjustable alignment and belt tensioning.
  - 2. Service Factor Based on Fan Motor Size: 1.5.
  - 3. Fan Pulleys: Cast iron or cast steel with split, tapered bushing; dynamically balanced at factory.
  - 4. Motor Pulleys: Adjustable pitch for use with motors through 5 hp; fixed pitch for use with larger motors. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.
  - 5. Belts: Oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.
  - 6. Belt Guards: Fabricate to comply with OSHA and SMACNA requirements of diamond-mesh wire screen welded to steel angle frame or equivalent, prime coated. Secure to fan or fan supports without short circuiting vibration isolation. Include provisions for adjustment of belt tension, lubrication, and use of tachometer with guard in place.
  - 7. Motor Mount: Adjustable for belt tensioning.
- H. Accessories:
  - 1. Access for Inspection, Cleaning, and Maintenance: Comply with requirements in ASHRAE 62.1.

2.3 MOTORS

- A. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors.

**PART 3 - EXECUTION**

3.1 INSTALLATION

- A. Install centrifugal fans level and plumb.
- B. Disassemble and reassemble units, as required for moving to the final location, according to manufacturer's written instructions.
- C. Lift and support units with manufacturer's designated lifting or supporting points.
- D. Equipment Mounting:
  - 1. Comply with requirements for vibration isolation and seismic control devices specified in Section 23 05 48 "Vibration and Seismic Controls for HVAC."
  - 2. Comply with requirements for vibration isolation devices specified in Section 23 05 48.13 "Vibration Controls for HVAC."
- E. Curb Support: Install roof curb on roof structure, level and secure, according to "The NRCA Roofing and Waterproofing Manual," Low-Slope Membrane Roofing Construction Details Section, Illustration "Raised Curb Detail for Rooftop Air Handling Units and Ducts." Install and secure centrifugal fans on curbs, and coordinate roof penetrations and flashing with roof construction. Secure units to curb support with anchor bolts.



- F. Unit Support: Install centrifugal fans level on structural curbs. Coordinate wall penetrations and flashing with wall construction. Secure units to structural support with anchor bolts.
- G. Isolation Curb Support: Install centrifugal fans on isolation curbs, and install flexible duct connectors and vibration isolation and seismic-control devices.
  - 1. Comply with requirements in Section 23 33 00 "Air Duct Accessories" for flexible duct connectors.
  - 2. Comply with requirements in Section 23 05 48 "Vibration and Seismic Controls for HVAC" for vibration isolation and seismic-control devices.
- H. Install units with clearances for service and maintenance.
- I. Label fans according to requirements specified in Section 23 05 53 "Identification for HVAC Piping and Equipment."

### 3.2 CONNECTIONS

- A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Section 23 33 00 "Air Duct Accessories."
- B. Install ducts adjacent to fans to allow service and maintenance.
- C. Install piping from scroll drain connection, with trap with seal equal to 1.5 times specified static pressure, to nearest floor drain with pipe sizes matching the drain connection.

### 3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Test and adjust controls and safeties. Controls and equipment will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

**END OF SECTION 23 34 16**



## SECTION 23 81 26 VARIABLE REFRIGERANT FLOW SYSTEM

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including Division 23 Specification Sections, and Common Work Requirements for HVAC apply to the work specified in this Section.

#### 1.2 SUMMARY

- A. This Section includes split multi-system heat pump units consisting of multiple evaporator-fan and variable speed compressor-condenser components. Condensing units are designed for exterior mounting. Each system shall be capable of heating or cooling at each individual evaporator at all times.

#### 1.3 SUBMITTALS

- A. Product Data: Include rated capacities, dimensions, connections for piping and electric, furnished specialties, and accessories for each type of product indicated. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.
- B. Shop Drawings: Diagram power, signal, and control wiring.
- C. Field quality-control test reports.
- D. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.
- E. Warranty: Special warranty specified in this Section.

#### 1.4 QUALITY ASSURANCE

- A. Product Options: Drawings indicate size, profiles, and dimensional requirements of split-system units and are based on the specific system indicated.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. ASHRAE Compliance: Applicable requirements in the latest edition of ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
- D. ASHRAE/IESNA 90.1 Latest Edition Compliance: Applicable requirements in the latest edition of ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."



- E. Standards: Title 24, California Mechanical Code.

1.5 COORDINATION

- A. Coordinate size and location of concrete bases for units. Cast anchor-bolt inserts into bases.
- B. Coordinate size, location, and connection details with roof curbs, equipment supports, and roof penetrations.

1.6 WARRANTY

- A. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within one year warranty period (parts and labor). Compressor shall be warranted for a period of five years.
  - 1. Special Warranty: Provide and alternate price for an extended warranty for all parts and components for five years from date of Substantial Completion (parts and labor).

1.7 DELIVERY AND STORAGE

- A. Deliver products to site and store and protect products until installation.
- B. Protect finished cabinets from physical damage by leaving factory packing cases in place before installation and by providing temporary covers after installation.

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Filters: One set of filters for each unit.
  - 2. Fan Belts: One set of belts for each unit.

**PART 2 - PRODUCTS**

2.1 MANUFACTURERS

- A. Manufacturers:
  - 1. Mitsubishi Electronics America, Inc.; HVAC Division.
  - 2. Or equal.

2.2 System Description

The variable capacity, heat pump heat recovery air conditioning system shall be a VRF (Variable Refrigerant Flow). The VRF systems shall be a split system heat pump capable of providing simultaneous cooling and heating.

The system shall consist of an outdoor unit, Branch Circuit Controller, multiple







indoor units and DDC (Direct Digital Controls). Each indoor unit or group of indoor units shall be capable of operating in any mode independently of other indoor units or groups. System shall be capable of changing mode (cooling to heating, heating to cooling) with no interruption to system operation. To ensure the City's comfort, each indoor unit or group of indoor units shall be independently controlled and capable of changing mode automatically when zone temperature strays 1.8 degrees F from set point for ten minutes. The sum of connected capacity of all indoor air handlers shall range from 50% to 150% of outdoor rated capacity.

2.3 Quality Assurance

- A. The units shall be listed by Electrical Testing Laboratories (ETL) and bear the ETL label.
- B. All wiring shall be in accordance with the National Electrical Code (N.E.C.).
- C. The units shall be manufactured in a facility registered to ISO 9001 and ISO14001 which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).
- D. All units must meet or exceed the 2010 Federal minimum efficiency requirements and the proposed ASHRAE 90.1 efficiency requirements for VRF systems. Efficiency shall be published in accordance with the DOE alternative test procedure, which is based on the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) Standards 340/360, 1230 and ISO Standard 13256-1.
- E. A full charge of R-410A for the condensing unit only shall be provided in the condensing unit.

2.4 Delivery, Storage and Handling

- A. Unit shall be stored and handled according to the manufacturer's recommendation.

2.5 The units shall be covered by the manufacturer's limited warranty for a period of one (1) year from date of installation.  
And shall be:

- A. Installed by a certified contractor.
- B. Verified with a completed commissioning report submitted to and approved by the manufacturer.

2.6 All manufacturer technical and service manuals must be readily available for download by any local contractor should emergency service be required. Registering and sign-in requirements which may delay emergency service reference are not allowed.



## 2.7 Y-SERIES OUTDOOR UNIT

### A. General:

The outdoor unit shall be specifically used VRF components. The outdoor units shall be equipped with multiple circuit boards that interface to the unit controls system and shall perform all functions necessary for operation. Each outdoor unit module shall be completely factory assembled, piped, wired and run tested at the factory.

1. The model nomenclature and unit requirements are shown below. All units requiring a factory supplied twinning kit shall be piped together in the field, without the need for equalizing line(s). If an alternate manufacturer is selected, any additional material, cost, and labor to install additional lines shall be incurred by the contractor.
2. Outdoor unit shall have a sound rating no higher than 60 dB(A) individually or 65 dB(A) twinned. Units shall have a sound rating no higher than 50 dB(A) individually or 55 dB(A) twinned while in night mode operation. If an alternate manufacturer is selected, any additional material, cost, and labor to meet published sound levels shall be incurred by the contractor.
3. There shall be no more than 3 branch circuit controllers connected to any one outdoor unit.
4. Outdoor unit shall be able to connect to up to 48 indoor units depending upon model.
5. Both refrigerant lines from the outdoor unit to indoor units shall be insulated.
6. The outdoor unit shall have an accumulator with refrigerant level sensors and controls.
7. The outdoor unit shall have a high pressure safety switch, over-current protection and DC bus protection.
8. The outdoor unit shall have the ability to operate with a maximum height difference of 164 feet and have total refrigerant tubing length of 1804-2625 feet. The greatest length is not to exceed 541 feet between outdoor unit and the indoor units without the need for line size changes or traps.
9. The outdoor unit shall be capable of operating in heating mode down to -4F ambient temperature or cooling mode down to 23F ambient temperature, without additional low ambient controls. If an alternate manufacturer is selected, any additional material, cost, and labor to meet low ambient operating condition and performance shall be incurred by the contractor.
10. The outdoor unit shall be capable of operating in cooling mode down to -10F with optional manufacturer supplied low ambient kit.
11. The outdoor unit shall be provided with a manufacturer supplied 20 gauge hot dipped galvanized snow /hail guard. The snow/hail guard protects the outdoor coil surfaces from hail damage and snow build-up in severe climates.
12. The outdoor unit shall have a high efficiency oil separator plus additional logic controls to ensure adequate oil volume in the compressor is maintained.

### B. Unit Cabinet:

1. The casing(s) shall be fabricated of galvanized steel, bonderized and finished. Units cabinets shall be able to withstand 960 hours per ASTM B117 criteria for seacoast protected models (-BS models).



- C. Fan:
1. Each outdoor unit module shall be furnished with one direct drive, variable speed propeller type fan.
  2. The fan motor shall have inherent protection, have permanently lubricated bearings, and be completely variable speed. The fan shall be factory set for operation under 0 in. WG external static pressure, but capable of normal operation under a maximum of 0,24 in. WG external static pressure via dipswitch.
  3. The fan motor shall be mounted for quiet operation.
  4. The fan shall be provided with a raised guard to prevent contact with moving parts.
  5. The outdoor unit shall have vertical discharge airflow.
- D. Refrigerant
1. R410A refrigerant shall be required for outdoor unit systems.
  2. Polyolester (POE) oil shall be required. Prior to bidding, manufacturers using alternate oil types shall submit material safety data sheets (MSDS) and comparison of hygroscopic properties for alternate oil with list of local suppliers stocking alternate oil for approval at least two weeks prior to bidding.
- E. Coil:
1. The outdoor coil shall be of nonferrous construction with lanced or corrugated plate fins on copper tubing.
  2. The coil fins shall have a factory applied corrosion resistant blue-fin finish.
  3. The coil shall be protected with an integral metal guard.
  4. Refrigerant flow from the outdoor unit shall be controlled by means of an inverter driven compressor.
  5. The outdoor coil shall include 4 circuits with two position valves for each circuit, except for the last stage.
- F. Compressor:
1. Each outdoor unit module shall be equipped with one inverter driven scroll hermetic compressor. Non inverter-driven compressors, which cause inrush current (demand charges) and require larger wire sizing, shall not be allowed.
  2. A crankcase heater(s) shall be factory mounted on the compressor(s).
  3. The outdoor unit compressor shall have an inverter to modulate capacity. The capacity shall be completely variable with a turndown of 19%-5% of rated capacity, depending upon unit size. The compressor shall be equipped with an internal thermal overload.
  4. The compressor shall be mounted to avoid the transmission of vibration.
  5. Field-installed oil equalization lines between modules are not allowed. Prior to bidding, manufacturers requiring equalization must submit oil line sizing calculations specific to each system and module placement for this project.
- G. Electrical:
1. The outdoor unit electrical power shall be 208/230 or 460 volts, 3-phase, 60 hertz.
  2. The unit shall be capable of satisfactory operation within voltage limitations of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz) or 414-506V (460V/60Hz).



3. The outdoor unit shall be controlled by integral microprocessors.
4. The control circuit between the indoor units and the outdoor unit shall be 24VDC completed using a 2-conductor, non-polar twisted pair shielded cable to provide total integration of the system.

H. Branch Circuit Controller:

1. The BC (Branch Circuit) Controllers shall include multiple branches to allow simultaneous heating and cooling by allowing either hot gas refrigerant to flow to indoor unit(s) for heating or subcooled liquid refrigerant to flow to indoor unit(s) for cooling. Refrigerant used for cooling must always be subcooled for optimal indoor unit LEV performance; alternate branch devices with no subcooling risk bubbles in liquid supplied to LEV and are not allowed.
2. The BC (Branch Circuit) Controllers shall be specifically used with R410A R2-Series systems. These units shall be equipped with a circuit board that interfaces to the controls system and shall perform all functions necessary for.
3. The unit shall have a galvanized steel finish. The BC Controller shall be completely factory assembled, piped and wired. Each unit shall be run tested at the factory. This unit shall be mounted indoors, with access and service clearance provided for each controller. The sum of connected capacity of all indoor air handlers shall range from 50% to 150% of rated capacity. The BC Controller shall be suitable for use in plenums in accordance with UL1995 ed 4.
4. The casing shall be fabricated of galvanized steel. Each cabinet shall house a liquid-gas separator and multiple refrigeration control valves. The unit shall house two tube-in-tube heat exchangers.
5. R410A refrigerant shall be required. All BC Controller refrigerant pipe connections shall be brazed or flared. Each branch shall have multiple two-position valves to control refrigerant flow. Service shut-off valves shall be field-provided/installed for each branch to allow service to any indoor unit without field interruption to overall system operation. Linear electronic expansion valves shall be used to control the variable refrigerant flow.

2.8 INDOOR UNIT

A. General – Wall Mounted:

The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, an emergency operation function and a test run switch. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.

B. The unit shall be used with the outdoor unit and BC Controller, outdoor unit. The units shall support individual control using DDC controllers.

C. Unit Cabinet:

1. All casings, regardless of model size, shall have the same white finish
2. Multi directional drain and refrigerant piping offering four (4) directions for refrigerant piping and two (2) directions for draining shall be standard.
3. There shall be a separate back plate which secures the unit firmly to the wall.



4. The indoor fan shall be an assembly with one or two line-flow fan(s) direct driven by a single motor.
5. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
6. A manual adjustable guide vane shall be provided with the ability to change the airflow from side to side (left to right).
7. A motorized air sweep louver shall provide an automatic change in airflow by directing the air up and down to provide uniform air distribution.

D. Filter:

1. Return air shall be filtered by means of an easily removable, washable filter.
2. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.
3. The tubing shall have inner grooves for high efficiency heat exchange.
4. All tube joints shall be brazed with phos-copper or silver alloy.
5. The coils shall be pressure tested at the factory.
6. A condensate pan and drain shall be provided under the coil.
7. Both refrigerant lines to the indoor units shall be insulated in accordance with the installation manual.

E. Controls:

1. This unit shall use controls provided by the manufacturer to perform functions necessary to operate the system.
2. The unit shall be able to control external backup heat.
3. The unit shall have a factory built in receiver for wireless remote control.
4. Indoor unit shall compensate for the higher temperature sensed by the return air sensor compared to the temperature at level of the occupant when in HEAT mode. Disabling of compensation shall be possible for individual units to accommodate instances when compensation is not required.
2. Control board shall include contacts for control of external heat source.
3. External heat may be energized as second stage with 1.8°F – 9.0°F adjustable deadband from set point.
6. Indoor unit shall include no less than four (4) digital inputs capable of being used for customizable control strategies.
7. Indoor unit shall include no less than three (3) digital outputs capable of being used for customizable control strategies.

F. Coil:

1. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.
2. The tubing shall have inner grooves for high efficiency heat exchange.
3. All tube joints shall be brazed with phos-copper or silver alloy.
4. The coils shall be pressure tested at the factory.
5. A condensate pan and drain shall be provided under the coil.
6. The unit shall be provided with an integral condensate lift mechanism that will be able to raise drain water 19-3/4” inches above the condensate pan.
7. Both refrigerant lines to the indoor units shall be insulated.

G. Electrical:

1. The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.



2. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).
- H. Controls:
1. This unit shall use controls provided to perform functions necessary to operate the system.
  2. Indoor unit shall compensate for the higher temperature sensed by the return air sensor compared to the temperature at level of the occupant when in HEAT mode. Disabling of compensation shall be possible for individual units to accommodate instances when compensation is not required.
  3. Control board shall include contacts for control of external heat source. External heat may be energized as second stage with 1.8 degree F deadband from set point.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. Install units level and plumb. Coordinate installation of units with architectural, mechanical and electrical work.
- B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.
- C. Install compressor-condenser components on equipment supports as detailed on Mechanical plans. Anchor units to supports with removable, cadmium-plated fasteners.
- D. Install seismic restraints.
- E. Install and connect precharged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

#### **3.2 CONNECTIONS**

- A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
  1. Connect refrigerant pipes with all accessories listed above. Comply with requirements in Division 23 Section "Refrigerant Piping and Specialties."
- B. Install piping adjacent to unit to allow service and maintenance.
- C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- D. Electrical Connections: Comply with requirements in Division 26 Sections for power wiring, switches, and motor controls.



- E. The control circuit between the indoor units and the outdoor unit shall be 24VDC completed using a 2-conductor, twisted pair shielded cable to provide total integration of the system. All wiring exposed or installed within walls shall be in conduit.

### 3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.
- B. Perform the following field tests and inspections and prepare test reports:
  - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
  - 2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
  - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Remove and replace malfunctioning units and retest as specified above.

### 3.4 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
  - 1. Complete installation and startup checks according to manufacturer's written instructions.

### 3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train the City's maintenance personnel to adjust, operate, and maintain units.

**END OF SECTION 23 81 26**



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## SECTION 26 05 19 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Building wires and cables rated 600 V and less.
  - 2. Connectors, splices, and terminations rated 600 V and less.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

### PART 2 - PRODUCTS

#### 2.1 CONDUCTORS AND CABLES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:
  - 1. Alpha Wire Company.
  - 2. American Bare Conductor.
  - 3. Southwire Company.
- B. Comply with UL 1277, UL 1685, and NFPA 70 for Type TC-ER cable used in VFC circuits.
- C. Conductors: Copper, complying with NEMA WC 70/ICEA S-95-658.

#### 2.2 CONNECTORS AND SPLICES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:
  - 1. 3M.
  - 2. AFC Cable Systems, Inc.
  - 3. Hubbell Power Systems, Inc.
  - 4. ILSCO.



- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

### **PART 3 - EXECUTION**

#### **3.1 CONDUCTOR MATERIAL APPLICATIONS**

- A. Feeders: Copper; stranded.
- B. Branch Circuits: Copper; stranded.

#### **3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS**

- A. Exposed Branch Circuits, Including in Crawlspace: Type THHN/THWN-2, single conductors in raceway.
- B. Branch Circuits Concealed in Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway.

#### **3.3 INSTALLATION OF CONDUCTORS AND CABLES**

- A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
- C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

#### **3.4 CONNECTIONS**

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- B. Make splices, terminations, and taps that are compatible with conductor material.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.



3.5 IDENTIFICATION

- A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."
- B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

3.7 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform the following tests and inspections.
  - 1. Perform each of the following visual and electrical tests:
    - a. Inspect exposed sections of conductor and cable for physical damage and correct connection according to the single-line diagram.
    - b. Test bolted connections for high resistance using one of the following:
      - 1) A low-resistance ohmmeter.
      - 2) Calibrated torque wrench.
      - 3) Thermographic survey.
    - c. Inspect compression applied connectors for correct cable match and indentation.
    - d. Inspect for correct identification.
    - e. Inspect cable jacket and condition.
    - f. Insulation-resistance test on each feeder conductor with respect to ground and adjacent conductors. Apply a potential of 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable for a one-minute duration.
    - g. Continuity test on each conductor and cable.
    - h. Uniform resistance of parallel conductors.
  - B. Cables will be considered defective if they do not pass tests and inspections.
  - C. Prepare test and inspection reports to record the following:
    - 1. Procedures used.
    - 2. Results that comply with requirements.
    - 3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

**END OF SECTION 26 05 19**



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## SECTION 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section includes grounding and bonding systems and equipment.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

#### 1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Insert manufacturer's name; product name or designation or comparable product by one of the following:
  1. Burndy; Part of Hubbell Electrical Systems.
  2. ERICO International Corporation.
  3. ILSCO.

#### 2.2 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

#### 2.3 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
  1. Solid Conductors: ASTM B 3.



## 2.4 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

## PART 3 - EXECUTION

### 3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 Insert number AWG and smaller, and stranded conductors for No. 6 Insert number AWG and larger unless otherwise indicated.

### 3.2 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.

### 3.3 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
  - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
  - 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.

### 3.4 FIELD QUALITY CONTROL

- A. Testing Agency: a qualified testing agency to perform tests and inspections.
- B. Perform tests and inspections.
  - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- C. Tests and Inspections:
  - 1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
  - 2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.



- D. Grounding system will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.
- F. Report measured ground resistances that exceed the following values:
  - 1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
- G. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify City promptly and include recommendations to reduce ground resistance.

**END OF SECTION 26 05 26**



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## SECTION 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Hangers and supports for electrical equipment and systems.
  - 2. Construction requirements for concrete bases.
- B. Related Requirements:
  - 1. Section 260548.16 "Seismic Controls for Electrical Systems" for products and installation requirements necessary for compliance with seismic criteria.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
    - a. Hangers.
    - b. Steel slotted support systems.
    - c. Nonmetallic support systems.
    - d. Trapeze hangers.
    - e. Clamps.
    - f. Turnbuckles.
    - g. Sockets.
    - h. Eye nuts.
    - i. Saddles.
    - j. Brackets.
  - 2. Include rated capacities and furnished specialties and accessories.
- B. Shop Drawings: For fabrication and installation details for electrical hangers and support systems.
  - 1. Trapeze hangers. Include product data for components.
  - 2. Steel slotted-channel systems.
  - 3. Nonmetallic slotted-channel systems.
  - 4. Equipment supports.
  - 5. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.



## PART 2 - PRODUCTS

### 2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4 factory-fabricated components for field assembly.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Allied Tube & Conduit.
    - b. Cooper B-Line, Inc.; a division of Cooper Industries.
    - c. ERICO International Corporation.
  - 2. Material: Galvanized steel.
  - 3. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
  - 4. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- C. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M steel plates, shapes, and bars; black and galvanized.
- D. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
  - 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
  - 2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
  - 3. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
  - 4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.

## PART 3 - EXECUTION

### 3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems unless requirements in this Section are stricter.
- B. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."
- C. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMTs, IMCs, and RMCs as **required by** NFPA 70. Minimum rod size shall be 1/4 inch in diameter.



### 3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.
- B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb .
- C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
  - 1. To Wood: Fasten with lag screws or through bolts.
  - 2. To New Concrete: Bolt to concrete inserts.
  - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
  - 4. To Existing Concrete: Expansion anchor fasteners.
  - 5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
  - 6. To Light Steel: Sheet metal screws.
  - 7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that comply with seismic-restraint strength and anchorage requirements.
- D. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

### 3.3 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Use 3000-psi Insert value, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements.
- C. Anchor equipment to concrete base as follows:
  - 1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
  - 3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.



3.4 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
  - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils .
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

**END OF SECTION 26 05 29**



## SECTION 26 05 33 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  1. Metal conduits, tubing, and fittings.
  2. Surface raceways.
  3. Boxes, enclosures, and cabinets.

#### 1.3 DEFINITIONS

- A. GRC: Galvanized rigid steel conduit.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

### PART 2 - PRODUCTS

#### 2.1 METAL CONDUITS, TUBING, AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  1. Allied Tube & Conduit.
  2. Southwire Company.
  3. Thomas & Betts Corporation.
  4. Western Tube and Conduit Corporation.
  5. Wheatland Tube Company.
- B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. GRC: Comply with ANSI C80.1 and UL 6.
- D. EMT: Comply with ANSI C80.3 and UL 797.
- E. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
- F. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.



1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
  2. Fittings for EMT:
    - a. Material: Steel.
    - b. Type: compression.
  3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
  4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.
- G. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

## 2.2 SURFACE RACEWAYS

- A. Listing and Labeling: Surface raceways and tele-power poles shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5. Manufacturer's standard enamel finish in color selected by Architect.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Mono-Systems, Inc.
    - b. Panduit Corp.
    - c. Wiremold / Legrand.
- C. Combination telecom/power raceways:
1. Large cross section area with fixed divider.
  2. Wiremold 4000 Series or approved equal.
- D. Single circuit:
1. Low profile, scuff resistant finish.
  2. Wiremold 700 series or approved equal.

## 2.3 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Adalet.
  2. Cooper Technologies Company; Cooper Crouse-Hinds.
  3. Erickson Electrical Equipment Company.
  4. Hoffman.
  5. Hubbell Incorporated.
  6. Thomas & Betts Corporation.
  7. Wiremold / Legrand.



- B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- D. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.
- E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- F. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
- G. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.

### **PART 3 - EXECUTION**

#### **3.1 RACEWAY APPLICATION**

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
  - 1. Exposed Conduit: GRC.
  - 2. Concealed Conduit, Aboveground: EMT .
  - 3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
  - 4. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
- B. Indoors: Apply raceway products as specified below unless otherwise indicated:
  - 1. Exposed, Not Subject to Physical Damage: EMT.
  - 2. Exposed and Subject to Severe Physical Damage: GRC. Raceway locations include the following:
    - a. Below 7' above floors.
    - b. Apparatus Bay.
- C. Minimum Raceway Size: 3/4-inch trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
  - 1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
  - 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
  - 3. EMT: Use compression, steel fittings. Comply with NEMA FB 2.10.
  - 4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
- E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.



- F. Do not install aluminum conduits, boxes, or fittings.
- G. Install surface raceways only where indicated on Drawings.

### 3.2 INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation.
- D. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.
- E. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- H. Support conduit within 12 inches of enclosures to which attached.
- I. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- J. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.
- K. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- L. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- M. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
- N. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.





- O. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.
- P. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
- Q. Surface Raceways:
  - 1. Install surface raceway with a minimum 2-inch radius control at bend points.
  - 2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.
- R. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.
- S. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
  - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
  - 2. Where an underground service raceway enters a building or structure.
  - 3. Where otherwise required by NFPA 70.
- T. Comply with manufacturer's written instructions for solvent welding RNC and fittings.
- U. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
  - 1. Use LFMC in damp or wet locations subject to severe physical damage.
  - 2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.
- V. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements.
- W. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.
- X. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
- Y. Locate boxes so that cover or plate will not span different building finishes.
- Z. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.



AA. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

3.3 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.4 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.  
1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

**END OF SECTION 26 05 33**



## SECTION 26 05 48.16 - SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Restraint channel bracings.
  - 2. Seismic-restraint accessories.
  - 3. Mechanical anchor bolts.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.
    - a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an agency acceptable to authorities having jurisdiction.
    - b. Annotate to indicate application of each product submitted and compliance with requirements.

#### 1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory as defined by OSHA in 29 CFR 1910.7 and that is acceptable to authorities having jurisdiction.
- B. Comply with seismic-restraint requirements in the CBC unless requirements in this Section are more stringent.

### PART 2 - PRODUCTS

#### 2.1 RESTRAINT CHANNEL BRACINGS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - 1. Cooper B-Line, Inc.; a Division of Cooper Industries.
  - 2. Hilti, Inc.
  - 3. Unistrut; Atkore International.



- B. Description: MFMA-4, shop- or field-fabricated bracing assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end, with other matching components, and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

## 2.2 SEISMIC-RESTRAINT ACCESSORIES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - 1. Cooper B-Line, Inc.; a Division of Cooper Industries.
- B. Hanger-Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.

## 2.3 MECHANICAL ANCHOR BOLTS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - 1. Cooper B-Line, Inc.; a Division of Cooper Industries.
  - 2. Hilti, Inc.
  - 3. Mason Industries, Inc.
- B. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Examine areas and equipment to receive vibration isolation and seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for reinforcement and cast-in-place anchors to verify actual locations before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 APPLICATIONS

- A. Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.
- B. Hanger-Rod Stiffeners: Install hanger-rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods caused by seismic forces.
- C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.



### 3.3 SEISMIC-RESTRAINT DEVICE INSTALLATION

- A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete."
- B. Equipment and Hanger Restraints:
  - 1. Install resilient, bolt-isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
  - 2. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction providing required submittals for component.
- C. Install cables so they do not bend across edges of adjacent equipment or building structure.
- D. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.
- E. Drilled-in Anchors:
  - 1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
  - 2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
  - 3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
  - 4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
  - 5. Set anchors to manufacturer's recommended torque using a torque wrench.
  - 6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

### 3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

- A. Install flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where connection is terminated to equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

### 3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Seismic controls will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.



3.6 ADJUSTING

- A. Adjust restraints to permit free movement of equipment within normal mode of operation.

**END OF SECTION 26 05 48.16**



## SECTION 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Identification for raceways.
  - 2. Identification of power and control cables.
  - 3. Identification for conductors.
  - 4. Warning labels and signs.
  - 5. Instruction signs.
  - 6. Equipment identification labels, including arc-flash warning labels.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for electrical identification products.

### PART 2 - PRODUCTS

#### 2.1 COLOR AND LEGEND REQUIREMENTS

- A. Raceways and Cables Carrying Circuits at 600 V or Less:
  - 1. Black letters on an orange field.

#### 2.2 LABELS

- A. Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Brady Corporation.
    - b. Champion America.
    - c. Emedco.
- B. Self-Adhesive Labels:
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. A'n D Cable Products.
    - b. Brady Corporation.
    - c. Brother International Corporation.



2. Preprinted, 3-mil- thick, vinyl flexible label with acrylic pressure-sensitive adhesive.
3. Vinyl, thermal, transfer-printed, 3-mil- thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

### 2.3 BANDS AND TUBES:

- A. Snap-Around, Color-Coding Bands for Raceways and Cables: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches long, with diameters sized to suit diameters of raceways or cables they identify, and that stay in place by gripping action.
  1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Brady Corporation.
    - b. Marking Services, Inc.
    - c. Panduit Corp.

### 2.4 TAPES AND STENCILS:

- A. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils thick by 1 to 2 inches wide; compounded for outdoor use.
  1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Brady Corporation.
    - b. Carlton Industries, LP.
    - c. Emedco.

### 2.5 CABLE TIES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  1. Ideal Industries, Inc.
  2. Marking Services, Inc.
  3. Panduit Corp.
- B. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, Type 6/6 nylon.
  1. Minimum Width: 3/16 inch .
  2. Tensile Strength at 73 deg F according to ASTM D 638: 12,000 psi .
  3. Temperature Range: Minus 40 to plus 185 deg F.

### 2.6 MARKINGS AND NAME PLATES

- A. Name plates: furnish and install a minimum size of 1” high and 3” wide by 3/32” thick matte white (for normal power) and red (for emergency power) laminated phenolic nameplates with ¼” white characters engraved in the plastic for all items of electrical equipment including, but not limited to switchboards, panel boards, automatic transfer switches, motor control centers, feeder circuit breakers, relays, time switches, disconnect switches, exposed pull or junction boxes, and all control equipment. Name plates will be attached with 2 cadmium-plated screws. Adhesive attachment will not be acceptable. Punch strip tape type name plates with card holders in any form are prohibited.





## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

### 3.2 INSTALLATION

- A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.
- B. Install identifying devices before installing acoustical ceilings and similar concealment.
- C. Verify identity of each item before installing identification products.
- D. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.
- E. Apply identification devices to surfaces that require finish after completing finish work.
- F. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- G. Attach plastic raceway and cable labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.
- H. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:
  - 1. Outdoors: UV-stabilized nylon.
  - 2. In Spaces Handling Environmental Air: Plenum rated.
- I. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.
- J. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
- K. Provide wire marker on each conductor in electrical panel pull box, outlet, and junction box. This includes all disconnects and connections. If more than one neutral conductor is present, mark each related circuit and panel number.



- L. Label outside of all cover plates of wiring devices and junction boxes with circuit and panel number. Each branch circuit device cover plate will be labeled (engraved or silk screen) to indicate the branch circuit and panel number. Devices will include, but not limited to, the following: toggle switches, dimmer switches and receptacle.

**END OF SECTION 26 05 53**



**SECTION 26 09 23 - LIGHTING CONTROL DEVICES**

**PART 1 - GENERAL**

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
  - 1. Indoor occupancy and vacancy sensors.
  - 2. Switchbox-mounted occupancy sensors.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
  - 1. Show installation details for the following:
    - a. Occupancy sensors.
    - b. Vacancy sensors.
  - 2. Interconnection diagrams showing field-installed wiring.
  - 3. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.5 WARRANTY

- A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace lighting control devices that fail(s) in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Faulty operation of lighting control software.
    - b. Faulty operation of lighting control devices.
  - 2. Warranty Period: Two year(s) from date of Substantial Completion.

**PART 2 - PRODUCTS**

2.1 INDOOR OCCUPANCY AND VACANCY SENSORS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - 1. Cooper Industries, Inc.
  - 2. Hubbell Building Automation, Inc.
  - 3. Leviton Manufacturing Co., Inc.
  - 4. Watt Stopper.





- B. General Requirements for Sensors:
  - 1. Ceiling-mounted, solid-state indoor vacancy sensors.
  - 2. Dual technology.
  - 3. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
  - 4. Operation:
    - a. Vacancy Sensor: Unless otherwise indicated, lights are manually turned on and sensor turns lights off when the room is unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
  - 5. Mounting:
    - a. Sensor: Suitable for mounting in any position on a standard outlet box.
    - b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.
    - c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
  - 6. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
  - 7. Bypass Switch: Override the "on" function in case of sensor failure.
  - 8. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc ; turn lights off when selected lighting level is present.
  
- C. Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.
  - 1. Sensitivity Adjustment: Separate for each sensing technology.
  - 2. Detector Sensitivity: Detect occurrences of 6-inch- minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. , and detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
  - 3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.
  - 4. Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of 1000 square feet when mounted 48 inches above finished floor.

2.2 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - 1. Cooper Industries, Inc.
  - 2. Leviton Manufacturing Co., Inc.
  - 3. Lutron Electronics Co., Inc.
  - 4. Watt Stopper.
  
- B. General Requirements for Sensors: Automatic-wall-switch occupancy sensor with manual on-off switch, suitable for mounting in a single gang switchbox using hardwired connection.
  - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application, and shall comply with California Title 24.
  - 2. Occupancy Sensor Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn lights off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.



3. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F.
4. Switch Rating: Not less than 800-VA load at 120 V, 1200-VA ballast load at 277 V, and 800-W incandescent.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine lighting control devices before installation. Reject lighting control devices that are wet, moisture damaged, or mold damaged.
- B. Examine walls and ceilings for suitable conditions where lighting control devices will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### **3.2 SENSOR INSTALLATION**

- A. Comply with NECA 1.
- B. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.
- C. Install and aim sensors in locations to achieve not less than 90-percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

#### **3.3 CONTACTOR INSTALLATION**

- A. Comply with NECA 1.
- B. Mount electrically held lighting contactors with elastomeric isolator pads to eliminate structure-borne vibration unless contactors are installed in an enclosure with factory-installed vibration isolators.

#### **3.4 WIRING INSTALLATION**

- A. Comply with NECA 1.
- B. Wiring Method: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch .
- C. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.
- D. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.
- E. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.



**3.5 IDENTIFICATION**

- A. Identify components and power and control wiring according to Section 260553 "Identification for Electrical Systems."
  - 1. Identify controlled circuits in lighting contactors.
  - 2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.
- B. Label time switches and contactors with a unique designation.

**3.6 FIELD QUALITY CONTROL**

- A. Perform the following tests and inspections:
  - 1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
  - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Lighting control devices will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

**END OF SECTION 26 09 23**



## SECTION 26 24 16 - PANELBOARDS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Lighting and appliance branch-circuit panelboards.

#### 1.3 DEFINITIONS

- A. ATS: Acceptance testing specification.
- B. GFCI: Ground-fault circuit interrupter.
- C. GFEP: Ground-fault equipment protection.
- D. HID: High-intensity discharge.
- E. MCCB: Molded-case circuit breaker.
- F. SPD: Surge protective device.
- G. VPR: Voltage protection rating.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of panelboard.
  - 1. Include materials, switching and overcurrent protective devices, SPDs, accessories, and components indicated.
  - 2. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.
- B. Handle and prepare panelboards for installation according to NEMA PB 1.

#### 1.6 FIELD CONDITIONS

- A. Environmental Limitations:



1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
  2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
    - a. Ambient Temperature: Not exceeding 40 deg F to plus 100 deg F.
    - b. Altitude: Not exceeding 1000 feet.
- B. Service Conditions: NEMA PB 1, usual service conditions, as follows:
1. Ambient temperatures within limits specified.
  2. Altitude not exceeding 1000 feet.
- C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by the City or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
1. Notify Construction Manager no fewer than two weeks in advance of proposed interruption of electric service.
  2. Do not proceed with interruption of electric service without City's written permission.
  3. Comply with NFPA 70E.
- 1.7 WARRANTY
- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.
1. Panelboard Warranty Period: 18 months from date of Substantial Completion.

## **PART 2 - PRODUCTS**

### 2.1 PANELBOARDS COMMON REQUIREMENTS

- A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Section 260548.16 "Seismic Controls for Electrical Systems."
- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Comply with NEMA PB 1.
- E. Comply with NFPA 70.
- F. Enclosures: Flush and Surface-mounted, dead-front cabinets.
  1. Rated for environmental conditions at installed location.
    - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
    - b. Outdoor Locations: NEMA 250, Type 3R.
  2. Height: 84 inches maximum.





3. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box. Trims shall cover all live parts and shall have no exposed hardware.
  4. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.
  5. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.
  6. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
  7. Finishes:
    - a. Panels and Trim: Steel and galvanized steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
    - b. Back Boxes: Same finish as panels and trim.
    - c. Fungus Proofing: Permanent fungicidal treatment for overcurrent protective devices and other components.
- G. Phase, Neutral, and Ground Buses:
1. Material: Hard-drawn copper, 98 percent conductivity.
    - a. Plating shall run entire length of bus.
    - b. Bus shall be fully rated the entire length.
  2. Interiors shall be factory assembled into a unit. Replacing switching and protective devices shall not disturb adjacent units or require removing the main bus connectors.
  3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
  4. Full-Sized Neutral: Equipped with full-capacity bonding strap for service entrance applications. Mount electrically isolated from enclosure. Do not mount neutral bus in gutter.
  5. Insert optional features.
- H. Conductor Connectors: Suitable for use with conductor material and sizes.
1. Terminations shall allow use of 75 deg C rated conductors without derating.
- I. Panelboard Short-Circuit Current Rating: Rated for series-connected system with integral or remote upstream overcurrent protective devices and labeled by an NRTL. Include label or manual with size and type of allowable upstream and branch devices listed and labeled by an NRTL for series-connected short-circuit rating.
1. Panelboards rated 240 V or less shall have short-circuit ratings as shown on Drawings, but not less than 10,000 A rms symmetrical.
  2. Panelboards rated above 240 V and less than 600 V shall have short-circuit ratings as shown on Drawings, but not less than 14,000 A rms symmetrical.
- J. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.
1. Panelboards and overcurrent protective devices rated 240 V or less shall have short-circuit ratings as shown on Drawings, but not less than 10,000 A rms symmetrical.
  2. Panelboards and overcurrent protective devices rated above 240 V and less than 600 V shall have short-circuit ratings as shown on Drawings, but not less than 14,000 A rms symmetrical.



2.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
  - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - 1. Eaton Electrical Sector; Eaton Corporation.
  - 2. General Electric Company; GE Energy Management - Electrical Distribution.
  - 3. Siemens Energy.
  - 4. Square D; by Schneider Electric.
- B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- C. Mains: Circuit breaker.
- D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - 1. Eaton Electrical Sector; Eaton Corporation.
  - 2. General Electric Company; GE Energy Management - Electrical Distribution.
  - 3. Siemens Energy.
  - 4. Square D; by Schneider Electric.
- B. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.
  - 1. Thermal-Magnetic Circuit Breakers:
    - a. Inverse time-current element for low-level overloads.
    - b. Instantaneous magnetic trip element for short circuits.
    - c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
  - 2. Arc-Fault Circuit Interrupter Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.

2.5 IDENTIFICATION

- A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.
- B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.
- C. Circuit Directory: Directory card inside panelboard door, mounted in transparent card holder.



1. Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.
- D. Circuit Directory: Computer-generated circuit directory mounted inside panelboard door with transparent plastic protective cover.
  1. Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.
- E. Arc Flash Warning labels: For new panelboards and any panelboards altered by the construction, provide Arc Flash warning labels per CEC. Contractor shall coordinate short circuit ratings with Utility Company and provide an Arc Flash rating submittal for review. Labels shall be provided based on approved submittal.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Verify actual conditions with field measurements prior to ordering panelboards to verify that equipment fits in allocated space in, and comply with, minimum required clearances specified in NFPA 70.
- B. Receive, inspect, handle, and store panelboards according to NEMA PB 1.1.
- C. Examine panelboards before installation. Reject panelboards that are damaged, rusted, or have been subjected to water saturation.
- D. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

#### **3.2 INSTALLATION**

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Comply with NECA 1.
- C. Install panelboards and accessories according to NEMA PB 1.1.
- D. Equipment Mounting:
  1. Attach panelboard to the vertical finished or structural surface behind the panelboard.
  2. Comply with requirements for seismic control devices specified in Section 260548.16 "Seismic Controls for Electrical Systems."
- E. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.



- F. Comply with mounting and anchoring requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."
- G. Mount top of trim 90 inches Insert height above finished floor unless otherwise indicated.
- H. Mount panelboard cabinet plumb and rigid without distortion of box.
- I. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- J. Mounting panelboards with space behind is recommended for damp, wet, or dirty locations. The steel slotted supports in the following paragraph provide an even mounting surface and the recommended space behind to prevent moisture or dirt collection.
- K. Mount surface-mounted panelboards to steel slotted supports 1 1/4 inch in depth. Orient steel slotted supports vertically.
- L. Install overcurrent protective devices and controllers not already factory installed.
  - 1. Set field-adjustable, circuit-breaker trip ranges.
  - 2. Tighten bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written instructions.
- M. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.
- N. Install filler plates in unused spaces.
- O. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future.
- P. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.

### 3.3 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems."
- B. Create a directory to indicate installed circuit loads; incorporate City's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- D. Device Nameplates: Label each branch circuit device in power panelboards with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."



- E. Install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems" identifying source of remote circuit.

### 3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
  - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- B. Acceptance Testing Preparation:
  - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
  - 2. Test continuity of each circuit.
- C. Tests and Inspections:
  - 1. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
  - 2. Perform the following infrared scan tests and inspections and prepare reports:
    - a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
      - 1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
- D. Panelboards will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results, with comparisons of the two scans. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

### 3.5 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.
- B. Set field-adjustable circuit-breaker trip ranges as indicated

### 3.6 PROTECTION

- A. Temporary Heating: Prior to energizing panelboards, apply temporary heat to maintain temperature according to manufacturer's written instructions.

**END OF SECTION 26 24 16**



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## SECTION 26 27 26 - WIRING DEVICES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Straight-blade convenience.
  - 2. GFCI receptacles.
  - 3. Toggle switches.
  - 4. Wall switch sensor light switches with dual technology sensors.
  - 5. Wall plates.

#### 1.3 DEFINITIONS

- A. Abbreviations of Manufacturers' Names:
  - 1. Cooper: Cooper Wiring Devices; Division of Cooper Industries, Inc.
  - 2. Hubbell: Hubbell Incorporated: Wiring Devices-Kellems.
  - 3. Leviton: Leviton Mfg. Company, Inc.
  - 4. Pass & Seymour: Pass& Seymour/Legrand.
- B. BAS: Building automation system.
- C. EMI: Electromagnetic interference.
- D. GFCI: Ground-fault circuit interrupter.
- E. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- F. RFI: Radio-frequency interference.
- G. SPD: Surge protective device.
- H. UTP: Unshielded twisted pair.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.



## PART 2 - PRODUCTS

### 2.1 GENERAL WIRING-DEVICE REQUIREMENTS

- A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.
- C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
  - 1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
  - 2. Devices shall comply with the requirements in this Section.
- D. Devices for City-Furnished Equipment:
  - 1. Receptacles: Match plug configurations.
  - 2. Cord and Plug Sets: Match equipment requirements.
- E. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

### 2.2 STRAIGHT-BLADE RECEPTACLES

- A. Duplex Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Hubbell Incorporated; # 5362.
    - b. Leviton Manufacturing Co., Inc.; # 16362.
    - c. Pass & Seymour/Legrand (Pass & Seymour); 5362 (duplex).

### 2.3 GFCI RECEPTACLES

- A. General Description:
  - 1. 125 V, 20 A, straight blade, non-feed-through type.
  - 2. Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, UL 943 Class A, and FS W-C-596.
  - 3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.
- B. Duplex GFCI Convenience Receptacles:
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Cooper Wiring Devices, Inc.
    - b. Hubbell Incorporated.
    - c. Leviton Manufacturing Co., Inc.; 7590.
    - d. Pass & Seymour/Legrand (Pass & Seymour); 2095.

### 2.4 TOGGLE SWITCHES

- A. Comply with NEMA WD 1, UL 20, and FS W-S-896.





- B. Switches, 120/277 V, 20 A:
  - 1. Single Pole:
    - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      - 1) Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.; .
      - 2) Hubbell Incorporated; Wiring Device-Kellems; HBL1221.
      - 3) Leviton Manufacturing Co., Inc.; 1221-2.
      - 4) Pass & Seymour/Legrand (Pass & Seymour); 1221-G.

2.5 WALL PLATES

- A. Single and combination types shall match corresponding wiring devices.
  - 1. Material for Finished Spaces: 0.05-inch- thick, anodized aluminum .
  - 2. Material for Unfinished Spaces: Galvanized steel.
  - 3. Material for Damp Locations: with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

2.6 FINISHES

- A. Device Color:
  - 1. Wiring Devices Connected to Normal Power System: White unless otherwise indicated or required by NFPA 70 or device listing.
  - 2. Wiring Devices Connected to Emergency Power System: Red.
  - 3. SPD Devices: Blue.
- B. Wall Plate Color: For plastic covers, match device color.

2.7 OCCUPANCY SENSORS

- A. All products shall be Watt Stopper product numbers:
  - 1. Ceiling sensors: WT-605, WT-600, WT-1105, WT-1100, WT-2205, WT-2200, WT-2250, WT-2255, WP-605, WP-1105, WP-2255, WP-2205, W-500A, W-1000A, W-2000A, W-2000H, UT-300, UT-305, UT-355, WPIR, DT-200, DT-205, DT-300, DT-305, DT-355, CX-100, CX-105, CI-200, CI-205, CI-300, CI-305, CI-355, CI-12, CI-24
  - 2. Wall switch sensors: PW-100, PW-100-24, PW-200, WS-200, WD-170, WD-180, WD-270, WD-280, WN-100-120, WN-100-277, UW-100, UW-100-24, UW-200, DW-100, DW-100-24, DW-200.
  - 3. Power and Auxiliary Packs: BZ-50, BZ-100, BZ-150, LC-100, C120E-P, C277E-P, S120/27-P, AT-120, AT-277
- B. Wall switch sensors shall be capable of detection of occupancy at desktop level up to 300 square feet, and gross motion up to 1000 square feet.
- C. Wall switch sensors shall accommodate loads from 0 to 800 watts at 120 volts; 0 to 1200 watts at 277 volts and shall have 180° coverage capability.



- D. Wall switch products shall utilize Zero Crossing Circuitry which increases relay life, protects from the effects of inrush current, and increases sensor's longevity.
- E. Dual technology sensors shall be wall mounted, corner mounted or ceiling mounted in such a way as to minimize coverage in unwanted areas.
- F. Dual technology sensors shall consist of passive infrared and ultrasonic technologies for occupancy detection. Products that react to noise or ambient sound shall not be considered.
- G. In the event of failure, a bypass manual override shall be provided on each sensor. When bypass is utilized, lighting shall remain on constantly or control shall divert to a wall switch until sensor is replaced. This control shall be recessed to prevent tampering.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.
- B. It shall be the contractor's responsibility to locate and aim sensors in the correct location required for complete and proper volumetric coverage within the range of coverage(s) of controlled areas per the manufacturer's recommendations. Rooms shall have ninety (90) to one hundred (100) percent coverage to completely cover the controlled area to accommodate all occupancy habits of single or multiple occupants at any location within the room(s). The locations and quantities of sensors shown on the drawings are diagrammatic and indicate only the rooms which are to be provided with sensors. The contractor shall provide additional sensors if required to properly and completely cover the respective room.
- C. Proper judgment must be exercised in executing the installation so as to ensure the best possible installation in the available space and to overcome local difficulties due to space limitations or interference of structural components. The contractor shall also provide, at the City's facility, the training necessary to familiarize the City's personnel with the operation, use, adjustment, and problem solving diagnosis of the occupancy sensing devices and systems.
- D. Coordination with Other Trades:
  - 1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
  - 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
  - 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
  - 4. Install wiring devices after all wall preparation, including painting, is complete.
- E. Conductors:
  - 1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.



2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
  3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
  4. Existing Conductors:
    - a. Cut back and pigtail, or replace all damaged conductors.
    - b. Straighten conductors that remain and remove corrosion and foreign matter.
    - c. Pigtailling existing conductors is permitted, provided the outlet box is large enough.
- F. Device Installation:
1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
  2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
  3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
  4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
  5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
  6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
  7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
  8. Tighten unused terminal screws on the device.
  9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.
- G. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
- H. Dimmers:
1. Install dimmers within terms of their listing.
  2. Verify that dimmers used for fan-speed control are listed for that application.
- I. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.
- 3.2 GFCI RECEPTACLES
- A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.
- 3.3 IDENTIFICATION
- A. Comply with Section 260553 "Identification for Electrical Systems."
  - B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black -filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.



3.4 FIELD QUALITY CONTROL

- A. Test Instruments: Use instruments that comply with UL 1436.
- B. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.
- C. Perform the following tests and inspections:
  - 1. Test Instruments: Use instruments that comply with UL 1436.
  - 2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.
- D. Tests for Convenience Receptacles:
  - 1. Line Voltage: Acceptable range is 115 to 125 V.
  - 2. Percent Voltage Drop under 15-A Load: A value of 2 percent or higher is unacceptable.
  - 3. Ground Impedance: Values of up to 2 ohms are acceptable.
  - 4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
  - 5. Using the test plug, verify that the device and its outlet box are securely mounted.
  - 6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.
- E. Wiring device will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

**END OF SECTION 26 27 26**



## SECTION 26 28 16 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Nonfusible switches.
  - 2. Enclosures.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
  - 1. Enclosure types and details for types other than NEMA 250, Type 1.
  - 2. Current and voltage ratings.
  - 3. Short-circuit current ratings (interrupting and withstand, as appropriate).
  - 4. Include evidence of NRTL listing for series rating of installed devices.
  - 5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.

#### 1.4 PROJECT CONDITIONS

- A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
  - 1. Ambient Temperature: Not less than minus 40 deg F and not exceeding 100 deg F.
  - 2. Altitude: Not exceeding 1000 feet.

#### 1.5 COORDINATION

- A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

### PART 2 - PRODUCTS

#### 2.1 NONFUSIBLE SWITCHES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide or comparable product by one of the following:
  - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
  - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.



3. Square D; a brand of Schneider Electric.
- B. Type GD, General Duty, Single Throw, 600 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.
- C. Accessories:
  1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.

## 2.2 ENCLOSURES

- A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
  1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
  2. Outdoor Locations: NEMA 250, Type 3R.
  3. Areas: NEMA 250, Type 4X, stainless steel.

## **PART 3 - EXECUTION**

### 3.1 EXAMINATION

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- C. Install fuses in fusible devices.
- D. Comply with NECA 1.

### 3.3 IDENTIFICATION

- A. Comply with requirements in Section 260553 "Identification for Electrical Systems."
  1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
  2. Label each enclosure with engraved metal or laminated-plastic nameplate.



3.4 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

**END OF SECTION 26 28 16**



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## SECTION 26 51 16 - FLUORESCENT INTERIOR LIGHTING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Interior fluorescent luminaires, lamps, and ballasts.
  - 2. Luminaire supports.

#### 1.3 DEFINITIONS

- A. BIM: Building information model.
- B. CAD: Computer-aided design.
- C. CCT: Correlated color temperature.
- D. CRI: Color Rendering Index.
- E. Fixture: See "Luminaire."
- F. IP: International Protection or Ingress Protection Rating
- G. Lumen: Measured output of lamp and luminaire, or both.
- H. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

#### 1.4 ACTION SUBMITTALS

- A. Shop Drawings: For nonstandard or custom luminaires.
  - 1. Include plans, elevations, sections, and mounting and attachment details.
  - 2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 3. Include diagrams for power, signal, and control wiring.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Sample warranty.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.





**1.7 WARRANTY**

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: Two year(s) from date of Substantial Completion.

**PART 2 - PRODUCTS**

**2.1 LUMINAIRE REQUIREMENTS**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. UL Compliance: Comply with UL 1598.

**2.2 BALLASTS FOR LINEAR FLUORESCENT LAMPS**

- A. Luminaires controlled by occupancy sensors shall have programmed-start ballasts.
- B. Electronic Programmed-Start Ballasts for T8 Lamps: Comply with ANSI C82.11 and the following:
  - 1. Automatic lamp starting after lamp replacement.
  - 2. Sylvania Quicktronic Prostart or approved equal.

**2.3 EMERGENCY FLUORESCENT POWER UNIT**

- A. Internal Type: Self-contained, modular, battery-inverter unit, factory mounted within luminaire body and compatible with ballast. Comply with UL 924.
  - 1. Emergency Connection: Operate one fluorescent lamp(s) continuously. Connect unswitched circuit to battery-inverter unit and switched circuit to luminaire ballast.
  - 2. Battery: Sealed, maintenance-free, nickel-cadmium type.
  - 3. Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay.

**2.4 FLUORESCENT LAMPS**

- A. T8 rapid-start lamps, rated 32-W maximum, nominal length of 48 inches, 2800 initial lumens (minimum), CRI of 75 (minimum), color temperature of 3500 K, and average rated life of 36,000 hours unless otherwise indicated.
- B. Sylvania Octron 800 XP XL or approved equal.

**2.5 STRIP LIGHT**

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - 1. Columbia Lighting; Hubbell Lighting Incorporated.
  - 2. Cooper Lighting.
- B. Integral junction box with conduit fittings.



**2.6 SURFACE MOUNT, LINEAR**

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - 1. Columbia Lighting; Hubbell Lighting Incorporated.
  - 2. Cooper Lighting.
  - 3. Lithonia Lighting; Acuity Brands Lighting, Inc.
- B. Universal mounting bracket.
- C. Integral junction box with conduit fittings.

**2.7 MATERIALS**

- A. Metal Parts:
  - 1. Free of burrs and sharp corners and edges.
  - 2. Sheet metal components shall be steel unless otherwise indicated.
  - 3. Form and support to prevent warping and sagging.
- B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

**2.8 LUMINAIRE SUPPORT COMPONENTS**

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before fixture installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

**3.2 TEMPORARY LIGHTING**

- A. If approved by the City, use selected permanent luminaires for temporary lighting. When construction is sufficiently complete, clean luminaires used for temporary lighting and install new lamps.



### 3.3 INSTALLATION

- A. Comply with NECA 1.
- B. Remote Mounting of Ballasts: Distance between the ballast and luminaire shall not exceed that recommended by ballast manufacturer. Verify, with ballast manufacturers, maximum distance between ballast and luminaire.
- C. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
- D. Install lamps in each luminaire.
- E. Coordinate layout and installation of luminaires and suspension system with other construction that penetrates ceilings or is supported by them.
- F. Supports:
  - 1. Sized and rated for luminaire weight.
  - 2. Able to maintain luminaire position after cleaning and relamping.
  - 3. Provide support for luminaire without causing deflection of ceiling or wall.
  - 4. Luminaire mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and vertical force of 400 percent of luminaire weight.
- G. Ceiling-Grid-Mounted Luminaire Supports: Use grid as a support element.
  - 1. Install ceiling support system rods or wires, independent of the ceiling suspension devices, for each luminaire. Locate not more than 6 inches from luminaire corners.
  - 2. Support Clips: Fasten to luminaires and to ceiling grid members at or near each luminaire corner with clips that are UL listed for the application.
  - 3. Luminaires of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support luminaires independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.
  - 4. Install at least one independent support rod or wire from structure to a tab on luminaire. Wire or rod shall have breaking strength of the luminaire weight at a safety factor of 3.
- H. Flush-Mounted Luminaire Support:
  - 1. Secured to outlet box.
  - 2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
  - 3. Trim ring flush with finished surface.
- I. Wall-Mounted Luminaire Support:
  - 1. Do not attach luminaires directly to gypsum board.
- J. Suspended Luminaire Support:
  - 1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
  - 2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
  - 3. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and wire support for suspension for each unit length of luminaire chassis, including one at each end.



4. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.
  - K. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" and Section 260533 "Raceways and Boxes for Electrical Systems" for wiring connections and wiring methods.
- 3.4 IDENTIFICATION
- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- 3.5 FIELD QUALITY CONTROL
- A. Perform the following tests and inspections:
  - B. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
    1. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.
  - C. Luminaire will be considered defective if it does not pass operation tests and inspections.
  - D. Prepare test and inspection reports.
- 3.6 ADJUSTING
- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.
    1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
    2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
    3. Adjust the aim of luminaires in the presence of the City.

**END OF SECTION 26 51 16**



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## SECTION 26 51 19 - LED INTERIOR LIGHTING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Interior solid-state luminaires that use LED technology.

#### 1.3 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color Rendering Index.
- C. Fixture: See "Lighting Fixture Schedule."
- D. IP: International Protection or Ingress Protection Rating.
- E. LED: Light-emitting diode.
- F. Lumen: Measured output of lamp and luminaire, or both.
- G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Arrange in order of luminaire designation.
  - 2. Include data on features, accessories, and finishes.
  - 3. Include physical description and dimensions of luminaires.
  - 4. Include emergency lighting units, including batteries and chargers.
  - 5. Include life, output (lumens, CCT, and CRI), and energy efficiency data.
- B. Shop Drawings: For nonstandard or custom luminaires.
  - 1. Include plans, elevations, sections, and mounting and attachment details.
  - 2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 3. Include diagrams for power, signal, and control wiring.



1.5 INFORMATIONAL SUBMITTALS

- A. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- B. Sample warranty.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.7 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
- B. Warranty Period: Five year(s) from date of Substantial Completion.

**PART 2 - PRODUCTS**

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7
- B. Seismic Performance: Luminaires and lamps shall be labeled vibration and shock resistant.
  - 1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified and the luminaire will be fully operational during and after the seismic event."

2.2 LUMINAIRE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.
- C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.
- D. Bulb shape complying with ANSI C79.1.
- E. CCT of 2700 K .
- F. Rated lamp life of 50,000 hours.
- G. Lamps dimmable from 100 percent to 0 percent of maximum light output.







H. Internal driver.

2.3 SURFACE MOUNT

- A. Manufacturers: Subject to compliance with requirements, provide products as indicated on lighting fixture schedule or approved equal.
- B. Integral junction box with conduit fittings.

**PART 3 - EXECUTION**

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before fixture installation. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 TEMPORARY LIGHTING

- A. If approved by the City, use selected permanent luminaires for temporary lighting. When construction is sufficiently complete, clean luminaires used for temporary lighting and install new lamps.

3.3 INSTALLATION

- A. Comply with NECA 1.
- B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
- C. Install lamps in each luminaire.
- D. Supports:
  - 1. Sized and rated for luminaire weight.
  - 2. Able to maintain luminaire position after cleaning and relamping.
  - 3. Provide support for luminaire without causing deflection of ceiling or wall.
  - 4. Luminaire mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and vertical force of 400 percent of luminaire weight.
- E. Flush-Mounted Luminaire Support:
  - 1. Secured to outlet box.
  - 2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
  - 3. Trim ring flush with finished surface.
- F. Wall-Mounted Luminaire Support:
  - 1. Attached to structural members in walls.



2. Do not attach luminaires directly to gypsum board.
  - G. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.
- 3.4 IDENTIFICATION
- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- 3.5 FIELD QUALITY CONTROL
- A. Perform the following tests and inspections:
    1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
    2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.
  - B. Luminaire will be considered defective if it does not pass operation tests and inspections.
  - C. Prepare test and inspection reports.

**END OF SECTION 26 51 19**



## SECTION 31 20 00 - EARTH MOVING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
- 1. Preparing subgrades for slabs-on-grade walks.
  - 2. Excavating and backfilling for buildings and structures.
  - 3. Drainage course for concrete slabs-on-grade.
  - 4. Subsurface drainage backfill for walls and trenches.
  - 5. Excavating and backfilling trenches for utilities and pits for buried utility structures
  - 6. Excavating well hole to accommodate elevator-cylinder assembly.

- B. Related Requirements:
- 1. Caltrans Standard Specifications, latest edition.

#### 1.3 DEFINITIONS

- A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
- 2. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
  - 3. Final Backfill: Backfill placed over initial backfill to fill a trench.
  - 4. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.
- B. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.
- C. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.
- D. 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 for changes in the Work.
  - 2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
  - 3. 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.
  - 4. Unclassified Excavation - Nature of materials to be encountered is not identified or described.



5. Pipe Base: The trench area between the bottom of the trench and the bottom of the pipe. Extend full width and length of trench
  6. Pipe Zone: Area of trench between the top of the pipe base and six inches above the pipe, unless otherwise indicated. Extend full width and length of trench.
  7. Backfill Zone: Area above Pipe Zone to finish grade.
- E. Fill: Soil materials used to raise existing grades.
- F. Structural Fill: Area within vertical planes located five feet outside the perimeter of each building; or one foot outside the outermost edge of the surface of roadways, parking areas, sidewalks, concrete traffic slabs, or their shoulders unless specifically indicated otherwise on the drawings.
- G. Nonstructural Areas: Graded areas for landscaping, including concrete walkways less than four feet wide, berms, and all other areas not defined as a structural fill or as storm water detention basin.
- H. Influence Area: Area within planes sloped downward and outward at an angle of 45 degrees from the horizontal from one foot outside the outermost edge at the surface of the roadways or shoulder. Verify influence angle with the Geotechnical Engineer; if none is given, use 45 shown.
- I. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1 cu. yd. for bulk excavation or 3/4 cu. yd. for footing, trench, and pit excavation that cannot be removed by rock-excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:
1. Equipment for Footing, Trench, and Pit Excavation: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch- maximum-width, short-tip-radius rock bucket; rated at not less than 138-hp flywheel power with bucket-curling force of not less than 28,700 lbf and stick-crowd force of not less than 18,400 lbf with extra-long reach boom.
  2. Equipment for Bulk Excavation: Late-model, track-mounted loader; rated at not less than 230-hp flywheel power and developing a minimum of 47,992-lbf breakout force with a general-purpose bare bucket.
- J. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material 3/4 cu. yd. or more in volume that exceed a standard penetration resistance of 100 blows/2 inches when tested by a geotechnical testing agency, according to ASTM D 1586.
- K. 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.
- L. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.



- M. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

**1.4 SUBMITTALS**

- A. Product Data: Submit under provisions of Division 01, product data and certificates of compliance for all products and materials proposed to be used under this section.
- B. Samples for Verification: For the following products, in sizes indicated below:
  - 1. Fill Samples: Submit, in air-tight containers, 10 lb sample of each type of fill to Owner's testing laboratory.

**1.5 QUALITY ASSURANCE**

- A. Soil Testing:
  - 1. Owner will employ and pay for the services of an independent testing laboratory to perform specified testing per CCR Title 24, and any other testing specifically indicated in the Contract Documents to verify compliance with the Contract Documents.
  - 2. Relative compaction, moisture, and permeability tests will be made at locations determined by the Owner Representative. When tests indicate that the specified requirements have not been achieved, that portion of the Work shall be reworked until the required density, moisture, and permeability had been attained. Re-testing to show compliance shall be at the Contractor's expense/
  - 3. Daily testing of materials and the work of the Contractor will be made during construction.
  - 4. Where solid material is required to be compacted to a percentage of maximum density, the maximum density at optimum moisture content will be determined in accordance with ASTM D 1557. Where cohesionless, free draining soil material is required to be densified to a percentage of relative density the calculation of relative density will be determined in accordance with ASTM D 4253 and D 4254. Field density in-place tests will be performed in accordance with ASTM D 2922, or by such other means acceptable to the Engineer.

**1.6 FIELD CONDITIONS**

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving operations.
  - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
  - 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
  - 1. Do not proceed with work on adjoining property until directed by Architect.
- C. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth-moving operations.
- D. Do not commence earth-moving operations until temporary site fencing and erosion-and sedimentation-control measures are in place.



- E. Do not commence earth-moving operations until plant-protection measures are in place.
- F. The following practices are prohibited within protection zones:
  - 1. Storage of construction materials, debris, or excavated material.
  - 2. Parking vehicles or equipment.
  - 3. Foot traffic.
  - 4. Erection of sheds or structures.
  - 5. Impoundment of water.
  - 6. Excavation or other digging unless otherwise indicated.
  - 7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- G. Do not direct vehicle or equipment exhaust towards protection zones.
- H. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.
- I. Environmental Conditions:
  - 1. Weather: Protect bearing surfaces under foundations. Should bearing surfaces become softened, excavate to solid bearing and fill with concrete, mix and strength as approved by the Owner Representative, to elevations indicated.
  - 2. No fill material shall be placed, spread, or rolled if weather conditions increase the moisture content above permissible limits. When work is interrupted by rain, the earthwork operations shall stop and not be resumed until directed by Owner's Representative.

## **PART 2 - PRODUCTS**

### **2.1 SOIL MATERIALS**

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.
  - 1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- D. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 294/D 2940M 0; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.
- E. Structural Fill:
  - 1. Fill material for structural pad areas or structural fill material may be native material obtained from onsite excavations, free from organic and inorganic debris. Particle size shall not exceed 3 inches of any dimension.



- 2. Imported soil shall consist of silts and sands that have Plasticity Index not greater than 20, 1 Liquid Limit less than 35, and Expansion Index not exceeding 20, a particle size not greater than 3 inches, and, when used in pavement areas, an R-value of 25 or greater.
- 3. Representative samples of material to be used for structural fill and earth fill shall be tested to determine the maximum density, optimum moisture content, and classification of the soil.
  
- F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.
- H. Drainage Course: Shall conform to Section 68 of the Caltrans Standard Specifications, Class 2 permeable. Material may be obtained and used from on-site excavation with the approval of the Geotechnical Engineer.
- I. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and zero to 5 percent passing a No. 4 sieve.
- J. Sand: ASTM C 33/C 33M; fine aggregate.
- K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 ROCK (RIPRAP) SLOPE PROTECTION (RSP)

- A. Rock riprap shall be angular and well graded rocks in accordance with Section 72 of the Caltrans Standard Specifications, Facing Class. Rock encountered during site grading operations may be utilized for Rock Slope Protection as approved by the Owner's representative. Rounded rock shall not be allowed.
- B. Grouted riprap shall be in accordance with section 72-5 of the Caltrans Standard Specifications.
- C. Rock slope protection fabric, if used, shall be in accordance with Section 88 of the Caltrans Standard Specifications.

2.3 ACCESSORIES

- A. Steel Plate
  - 1. When steel plate bridging is provided in-lieu of backfill and temporary asphalt, it shall conform to Section 602.1 of the Caltrans Encroachment Permit Manual, with the following minimum thickness:

<u>Trench Width</u>	<u>Minimum Plate Thickness</u>
10"	1/2"
1'-11"	3/4"







2'-7"	7/8"
3'-5"	1-1/4"
5'-3"	[]

- 2. For spans greater than 5 feet 3 inches, a structural design shall be prepared by a civil engineer registered with the State of California.

**PART 3 - EXECUTION**

**3.1 PREPARATION**

- A. Should indicated conditions conflict with actual conditions and contours, notify the Owner's Representative and await directions before proceeding. Commencement of work indicates acceptance of existing conditions.
- B. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.
- C. Protect and maintain erosion and sedimentation controls during earth-moving operations.
- D. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.
- E. Perform cleaning and grubbing approximately 6" to ensure complete removal of any underlying debris.
- F. Material with concentrations of organics greater than 5 percent, as determined by ASTM D2974, shall be removed or placed in non-structural areas. Strippings shall not be used within embankment, structural, or pavement fills and shall be spread in the designated excess fill disposal area shown on the Drawings.

**3.2 DEWATERING**

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- B. Dewatering facilities shall be installed and functioning prior to excavation below groundwater levels in order to avoid heave of the excavation and to allow for drawdown of groundwater surfaces to below the lowest adjacent excavation.
- C. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
  - 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

**3.3 EXCAVATION, GENERAL**

- A. General:







1. Excavate for structured to the lines and grades shown or as required to accomplish construction. Perform all excavation regardless of the type, nature, or condition of the material encountered. The method of excavation used is optional; however, no heavy equipment shall be operated within 5 feet of existing structures or newly completed construction, except as approved. Excavation that cannot be accomplished without endangering the present or new structures shall be performed with hand tools. The bottom of all excavations shall be proof rolled to observe the presence of any potentially soft, yielding subgrade conditions. Notify the Owner Representative prior to commencement of proof rolling.
2. Excavations and trenches shall be properly sheeted, shored, braced and/or sloped to support adjacent earth banks, structures, construction materials, and equipment and to provide safe working conditions. No trench, pit, or other excavation shall remain open longer than is necessary to expeditiously carry out the work.

#### 3.4 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 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.
  2. Pile Foundations: Stop excavations 6 to 12 inches above bottom of pile cap before piles are placed. After piles have been driven, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.
- B. Excavations at Edges of Tree- and Plant-Protection Zones:
  1. Excavate by hand or with an air spade to indicated lines, cross sections, elevations, and subgrades. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
  2. Cut and protect roots of trees within construction area.

#### 3.5 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

#### 3.6 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
  1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.



- B. Excavate trenches to uniform widths to provide the following 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. Any part of the trench excavated below grade shall be backfilled with stabilization or pipe base/zone material as approved by Owner Representative and compacted to a density equal to the undisturbed trench bottom at Contractor's expense. On all roadways, except with specific approval of the Owner's Representative, no more than 150 feet of open trench shall be excavated in advance of laying the pipe. No excavated trench shall remain open at the end of each day's work without trench plates. All operations shall be carried out in an orderly fashion. Backfilling, compacting, base and cleanup shall be accomplished as sections of the pipe are installed.
  - 1. Clearance: 12 inches each side of pipe or conduit.
  
- 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. For pipes and conduit less than 6 inches in nominal diameter, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
  - 2. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe or conduit circumference. Fill depressions with tamped sand backfill.
  - 3. For flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support conduit on an undisturbed subgrade.
  - 4. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.
  
- D. Trenches in Tree- and Plant-Protection Zones:
  - 1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
  - 2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.

### 3.7 SUBGRADE INSPECTION

- A. Notify Architect when excavations have reached required subgrade.
  
- B. If Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
  
- C. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired dump truck to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
  - 1. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by the City, and replace with compacted fill or as directed.
  
- D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.



3.8 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect.
  - 1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

3.9 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.

3.10 BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
  - 1. Construction below finish grade including, where applicable, sub drainage, damp proofing, waterproofing, and perimeter insulation.
  - 2. Surveying locations of underground utilities for Record Documents.
  - 3. Testing and inspecting underground utilities.
  - 4. Removing concrete formwork.
  - 5. Removing trash and debris.
  - 6. Removing temporary shoring, bracing, and sheeting.
  - 7. Installing permanent or temporary horizontal bracing on horizontally supported walls.
- B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.11 UTILITY TRENCH BACKFILL

- E. Trenching, backfilling, and compacting shall have the approval of Owner Representative. Work shall be done only under the general observation and, where required, the detailed inspection of the Owner Representative. Do not backfill until each specific location is approved. [Water lined shall be pressure tested and approved by the CSFM before pipe zone and backfill zone materials are installed.]
- F. Place backfill on subgrades free of mud, frost, snow, or ice.
- C. Trenches under Footings: 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.
- D. Trenches under Roadways: Provide 4-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 4 inches of concrete before backfilling or placing roadway subbase course.
- E. Backfill voids with satisfactory soil while removing shoring and bracing.
- F. Pipe base and pipe zone:



1. Use sand conforming to ASTM 33 for conduit of any material less than 3-inch diameter and PVC pipe of any size.
2. Use subbase material for all piping.
3. Use controlled low strength material as required per plans.
4. Place material simultaneously on both sides of pipe in a manner approved by the City Representative. Lifts shall not exceed six inches.

**G. Initial Backfill:**

1. Soil Backfill: Place and compact initial backfill of subbase material, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.
  - a. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

**H. Final backfill: Place and compact final backfill of satisfactory soil to final subgrade elevation.**

**3.12 SOIL FILL**

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- B. Place and compact fill material in layers to required elevations as follows:  
Under walks and pavements, use satisfactory soil material.
  1. Under steps and ramps, use engineered fill.
  2. Under building slabs, use engineered fill.
  3. Under footings and foundations, use engineered fill.

**C. Place soil fill on subgrades free of mud, frost, snow, or ice.**

**3.13 SOIL MOISTURE CONTROL**

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
  1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
  2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

**3.14 COMPACTION OF SOIL BACKFILLS AND FILLS**

- A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698 and 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 at 95 percent.
2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 92 percent.
5. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.
6. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent.

### 3.15 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
  1. Provide a smooth transition between adjacent existing grades and new grades.
  2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

### 3.16 ROCK (RIP RAP) SLOPE PROTECTION

- A. Rock riprap shall be so placed as to provide a minimum of voids. The larger rocks shall be placed in the toe course and on the outside surface of the slope protection surface. Local surface irregularities shall not vary from the design grades by more than 1 foot measured at right angles to the slope.
- B. All rock slope protection shall be installed per Method "A" in accordance with section 72-2.03 of the Caltrans Standard Specifications.
- C. Grouted riprap shall be installed in accordance with section 72-5.04 of the Caltrans Standard Specifications for placement of concrete.
- D. Rock slope protection fabric shall be installed in accordance with section 72-2.025 of the Caltrans Standard Specifications.

### 3.17 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

- A. Place subbase course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place subbase course under pavements and walks as follows:  
Shape subbase course to required crown elevations and cross-slope grades.
  1. Place subbase course 6 inches or less in compacted thickness in a single layer.
  2. Place subbase course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
  3. Compact subbase course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 698 AND ASTM D 1557.



**3.18 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE**

- 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 6 inches or less in compacted thickness in a single layer.
  - 1. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
  - 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.

**3.19 PROTECTION**

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
  - 1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
  - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

**END OF SECTION 31 20 00**



## SECTION 32 01 16 - COLD MILLING ASPHALT PAVEMENT

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Summary
  - 2. Related Work Specified Elsewhere
  - 3. Reference Standards
  - 4. General
- B. Related Requirements
  - 1. Drawings and general Provisions of the Contract, including General and Supplementary Special Provisions, and 2015 Green Book and White Book General Provisions apply to this Section.
- C. Description
  - 1. The work includes the cold milling and removal of asphalt paving, as necessary to complete the contract work as shown on the drawings and as specified in these technical specifications. Work also includes the removal, hauling, and disposal of milled asphalt and other removed roadway materials outside Tidelands. Other incidental work will be necessary to complete the Work as shown on the plans.

#### 1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 321216 - Asphalt Paving

#### 1.3 Reference Standards

- A. Standard Specifications
  - 1. Standard Specifications for Public Works Construction, “Greenbook” (SSPWC), 2015 Edition, including the Regional Supplement.
  - 2. State of California, Department of Transportation, Standard Specifications, 2015.
- B. Standard Drawings
  - 1. City of San Diego Standard Drawings (2016)

### PART 2 - PRODUCTS (NOT USED)

### PART 3 - EXECUTION

#### 3.1 GENERAL

- A. All work of Cold Milling Asphalt Pavement shall conform to Section 302-1 “Cold Milling Asphalt Concrete Pavement” of the SSPWC, and CALTRANS Section 42 ‘Groove and Grind Pavement’ as shown on the drawings and as specified in these specifications.



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- B. All work of overlay shall be placed to a minimum depth of 1.5” to 2” as shown on the drawings and shall conform to Section 302-5 “Asphalt Concrete Pavement” of the SSPWC as shown on the drawings and as specified in these specifications.
- C. Contractor to refer to City of San Diego Standard Drawing SDG-106 for Cold Milling Details.
- D. Contractor shall be responsible for the removal, hauling and disposal of all milled asphalt and other removed roadway materials.

**END OF SECTION 32 01 16**





SECTION 32 11 23 - AGGREGATE BASE

PART 1 - GENERAL

1.1 SUMMARY:

- A. This Section includes the following:
  - 1. Summary
  - 2. Applicable Publications
  - 3. Submittals
  - 4. Aggregate Base
  - 5. Aggregate Base Compaction
- B. Drawings and general provisions of the Contract, including General and Supplementary Special Provisions, and 2015 Green Book and White Book General Provisions, apply to this Section.
- C. Description:
  - 1. Furnishing and spreading of aggregate base as shown on the pavement section on the plans.
  - 2. Compact to 95% relative compaction to the total depth shown on the plans.
  - 3. Re-grade to allow for the placement of new asphalt as shown on the plans to meet the existing finish grade of the areas surrounding the work and allow for drainage of the new pavement area. Fine grade to the grades required prior to placement of asphalt.
  - 4. Other ancillary items of work as shown on the drawings and as specified on this Section

1.2 APPLICABLE PUBLICATIONS

The publications of the most recent edition and addenda listed below form a part of these specifications to the extent referenced. The publications are referred to in the text by the basic designation only.

- A. The State of California Department of Transportation Standard Specifications (CALTRANS)
- B. American Society for Testing and Materials (ASTM)
 

ASTM D1557	Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-lb. (4.54 kg) Rammer and 18-inch (457 mm) Drop
ASTM D2419	Test Method for Sand Equivalent Value of Soils and Fine Aggregate

1.3 SUBMITTALS

Submit the following:





- A. An aggregate mix design conforming to provisions in Section 26 “Aggregate Bases,” CALTRANS.
  - 1. The results of quality testing for Sand Equivalent and R-value (if Sand Equivalent is less than 55). This requirement shall not be considered to be in lieu of material testing otherwise required by the Engineer.

**PART 2 - PRODUCTS**

**2.1 AGGREGATE BASE**

Aggregate Base shall be Class 2 (3/4-inch maximum aggregate) conforming to provisions in Section 26, “Aggregate Bases,” CALTRANS. Except that the reclaimed material can comprise 100% of the mix.

- A. The aggregate shall not be treated with lime, cement, or other chemical material before performing Durability Index, Grading (Sieve Analysis), Resistance (R- Value) or sand equivalent.
- B. The R-value may be waived provided the material has a Sand Equivalent of 55 or more.
- C. The moving average percent passing will not be used.

**PART 3 - EXECUTION**

**3.1 AGGREGATE BASE COMPACTION**

- A. Aggregate Base shall be compacted in accordance with Section 26-1.05 “COMPACTING” (Aggregate Bases)” CALTRANS.
- B. Whenever this Section require compliance with specified values for the following properties, test will be made by the California Test or ASTM Test indicated unless otherwise specified:

Properties	California Test	ASTM Test
Relative Compaction	216 or 231	D 1557

- C. Whenever a reference is made herein to a Test by number, it shall mean the California or ASTM Test in effect on the day the Notice to Proceed is issued.

**END OF SECTION 32 11 23**





## SECTION 32 12 16 - ASPHALT PAVING

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Summary
2. Related Work Specified Elsewhere
3. Reference Standards
4. Submittals
5. Quality Assurance
6. Asphalt Materials
7. Surface Preparation
8. Asphalt Paving
9. Joints
10. Compaction
11. Density
12. Surface Tolerance
13. Pavement Marking

##### B. Related Requirements:

1. Drawings and general provisions of the Contract, including General and Supplementary Special Conditions and 2015 Green Book and White Book General Provisions, apply to this Section.

##### C. Description

1. The work includes furnishing and mixing aggregate and asphalt binder at a central mixing plant, spreading and compacting the mixture, furnishing and other ancillary work for asphalt pavement as on the drawings and as specified in these technical specifications.

#### 1.2 REFERENCE STANDARDS

##### A. The following publications form part of this Section to the extent indicated by reference thereto. Where this Section exceeds the requirements of the publications listed below, the requirements of this Section shall govern. The publications are listed in order of precedence.

1. City of San Diego Regional Standard Drawings, referred to hereinafter as RSD.
2. Caltrans Standard Specifications, referred to hereinafter as CALTRANS

#### 1.3 SUBMITTALS

##### A. Contractor shall submit the following for engineer's approval:

1. Product Data
  - a. Asphalt Concrete Mix Design - Prepared by a materials laboratory under the direct supervision of a California Registered Civil Engineer.
  - b. Paving Fabric - see drawings and specifications for requirements.
2. Material Certificates



- a. Asphalt Binder (PH 64-10) - Certificate of Compliance from the Supplier
- b. Aggregate: Provision for sampling at the source by the Engineer, and submission of a combined aggregate grading of the aggregate to be used together with Cleanness Values.
- c. Track Coat - Certificate of Compliance from the supplier.

#### 1.4 QUALITY ASSURANCE

##### A. Manufacturer Qualifications:

1. Contractor shall notify the Engineer of the source of materials and mixing plant he intends to use at least two (2) weeks in advance of paving operations in order that acceptance tests and mix design tests can be completed.

### **PART 2 - PRODUCTS**

#### 2.1 ASPHALT MATERIALS

- A. Tack Coat shall be asphaltic emulsion SS-1h conforming to the provisions in Section 94, "Asphaltic Emulsions," CALTRANS at Contractor's option.
- B. Asphalt Binder for asphalt concrete pavement shall be PG 64-10 conforming to Section 92, "Paving Asphalts," CALTRANS.
- C. Aggregate for Asphalt Concrete shall conform to CALTRANS Section 92 and shall be 1/2-inch maximum, medium grading when the compacted thickness is equal to or greater than 1.5 inches and 3/8-inch maximum when compacted thicknesses are less than 1.5 inches and for feathering, filling large cracks and joints on asphalt concrete and concrete pavement surfaces, and filling depressions, spalls and holes in asphalt concrete pavement.
- D. Asphalt Concrete shall be Type B conforming to CALTRANS Section 39 and these Technical Specifications.

### **PART 3 - EXECUTION**

#### 3.1 SURFACE PREPARATION

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
- B. Tack Coat:
  1. All tack coat work shall conform to the provision in Section 39-4.02, "Prime Coat and Paint Binder", CALTRANS.
  2. Apply uniformly to existing AC surfaces and other vertical surfaces in contract with new AC pavement.
  3. Allow Tack Coat to cure undisturbed before applying the hot-mix asphalt paving.
  4. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings.
  5. Remove spillages and clean affected surfaces.



**3.2 ASPHALT PAVING**

- A. Asphalt Paving shall be constructed in accordance with Section 39 'Asphalt Concrete' of CALTRANS Specification and as specified on this Section.
- B. 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 as shown on the Drawing.
  - 1. Spread mix at minimum temperature of 250 deg F (121 deg C)
  - 2. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
- 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.

**3.3 JOINTS**

- A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.
  - 1. Clean contact surfaces and apply tack coat to joints.
  - 2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
  - 3. Offset transverse joints, in successive courses, a minimum of 24 inches.
  - 4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time.

**3.4 COMPACTION**

- A. The compaction of asphalt concrete after rolling shall be 95% of the density obtained with the California Kneading Compactor per California Test 304.
- B. After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- C. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

**3.5 DENSITY**

- A. The field density of compacted asphalt concrete will be determined per ASTM D 1188 requiring slabs or cores to be taken for laboratory testing. Zinc stearate may be substituted for paraffin. Contractor shall repair pavement where cores are taken and all such repairs shall be at no additional cost to the City.



3.6 SURFACE TOLERANCE AND WATER TEST

- A. After the paving has been completed and prior to sealing, the asphalt concrete surface shall be tested by use of a 12-foot straight edge to a finished surface tolerance of not greater than one-quarter inch in ten feet from the straight edge, and shall be water tested to assure positive drainage at no additional cost to the City. Low spots shall be corrected by the Contractor at no additional cost to the City.

3.7 PAVEMENT MARKINGS AND STRIPING

- A. See Section 321723, PAVEMENT MARKINGS AND STRIPING, of these Specifications.

**END OF SECTION 32 12 16**



## SECTION 32 13 13 - CONCRETE PAVING

### PART 1 - GENERAL

#### 1.1 SUMMARY OF WORK

- A. The scope of work in this section includes, but is not necessarily limited to concrete sidewalk, stamped concrete, commercial driveways, pedestrian ramps and related concrete improvements as shown on drawings and specified below.

#### 1.2 REFERENCE STANDARDS

- A. Standard Specifications
  - 1. Standard Specifications for Public Works Construction "GREENBOOK" (SSPWC), 2015 Edition, including the Regional Supplement.
  - 2. State of California, Department of Transportation, Standard Specifications, 2015.
- B. Standard Drawings
  - 1. San Diego Regional Standard Drawings (RSD) (2016).
  - 2. State of California, Department of Transportation, Standard Plans, 2015.
  - 3. American Society for Testing and Materials, referred to hereinafter as ASTM.

#### 1.3 SUBMITTALS

- A. Materials List/Samples
  - 1. Within 7 days of contract award, provide complete list of proposed materials to the City's Representative. Submittals shall include but are not limited to mix design, air-entraining admixtures and related product data. Contractor shall supply test data for compressive strength, air-entrainment and slump per SSPWC Section 201.

### PART 2 - PRODUCTS

#### 2.1 DESIGN CRITERIA

- A. Where criteria shown on drawings or specified in this specification exceed that of the referenced standards, and the work involves non-public improvements, the more stringent criteria shall apply.
- B. The following shall be the minimum concrete strengths for concrete paving work:
  - 1. Concrete Sidewalk : 560-C-3250
  - 2. Driveways and curb and gutter : 560-C-3250
  - 3. Stamped Median Concrete per SDG-112: 560-C-3250
  - 4. Pedestrian Ramps" 560-C-3250



**2.2 PORTLAND CEMENT CONCRETE**

- A. Concrete shall consist of Portland cement, concrete aggregates, water, and when specified or approved for use, chemical admixtures, and/or SCMs, fibers, color, and/or reclaimed concrete material. Concrete shall be specified by class, alternate class, special exposure, or compressive strength, and shall be per Section 201-1 of the SSPWC.
- B. Concrete shall be integral color per Section 303-7.3 Method B - Integral Color of the SSPWC.

**2.3 EXPANSION JOINT MATERIAL**

- A. Expansion Joints: Conform to ASTM D-1751, size, height, and location as noted on the drawings or as per San Diego RSD if not on plans. Joints shall be impregnated felt unless otherwise specified on drawings. Provide zip strip and sealant as indicated.

**2.4 JOINT SEALANT MATERIAL**

- A. Joint sealant material shall be per Section 201-3 of the SSPWC. When adjacent to integral color concrete, color shall match integral color.

**2.5 WEAKENED PLANE JOINTS**

A.

Greenstreak 852 or equal. No saw cutting or “zip-strip” joints permitted. Use of custom joint forming tool acceptable with prior City's Representative approval.

**2.6 CURING COMPOUND**

- A. Provide Burke Aqua Resin or equal, with fugitive dye, and complying with ASTM C309, Type 1-D at all natural color concrete.
- B. Provide colored concrete curing compound per Section 303-7.4 of the SSPWC and comply with ASTM C309.

**2.7 TRUNCATED DOMES**

- A. The tiles shall have the manufacturer's logo stamped permanently on the product with identifying information such as model number and type. Color shall be safety yellow per Federal Yellow FS 33538 of Federal Standard 595 C. The surface of the panels shall be protected by plastic cover provided by the manufacturer. Manufacturer of the truncated domes shall be Armorcast, Access Tile, or approved equal.
  - 1. ARMORCAST Detectable Warning Panels, Wet Set 3' x 4' Panel with color matching bolts and five (5) year manufacturer warranty.
  - 2. ACCESS TILE, Tactile System, 3' x 4' cast in place replaceable and surface applied panels with color matching stainless steel bolts and five (5) year manufacturer warranty.





## 2.8 OTHER MATERIALS

- A. All other materials, not specifically described but required for complete and proper installation of this work, shall be selected by the Contractor and subject to the approval of the City.

## PART 3 - EXECUTION

### 3.1 SURFACE CONDITION

- A. Inspection
  1. Prior to all work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
  2. Verify that concrete pavement may be installed in strict accordance with the original design, all pertinent codes and regulations, and all pertinent portions of the referenced standards.
- B. Discrepancies
  1. In the event of discrepancy, immediately notify the City.
  2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

### 3.2 FORMWORK

- A. General
  1. Construct forms accurately to dimensions, plumb and true to line and grade.
  2. Use forms that are substantial, mortar tight, braced and tied so as to maintain position and shape during placing of reinforcing and concrete.
  3. Wavy surfaces and bulged walls or slap surfaces resulting from settlement or springing of formwork will be rejected.
  4. Carefully verify and check all forms for alignment/elevation and level as the work proceeds. Promptly make all needed adjustments or additional bracing.
- B. Construction Joints
  1. Construct and assemble forms in such a manner that joints occur at accepted locations. Thoroughly clean forms before pouring concrete.
- C. Details
  1. Take extreme care in all details of forming, setting and reinforcing. Except when tooled or radiuses corners are indicated, provide all exposed concrete finish work with smooth, even surfaces of dense concrete with clean sharp arises and outside corners.
- D. Prior to Pouring Concrete
  1. Thoroughly clean out all forms to be used.
  2. Thoroughly wet wood forms as required where form coatings are not used.
- E. Removal of Forms
  1. Do not remove support forms or shoring until concrete has sufficient strength to carry its own weight and other loads upon it.



2. Remove forms only after concrete has properly set and without damaging concrete.

### 3.3 CONCRETE PAVING INSTALLATION

#### A. Preparation

1. Verify sub-grade, conduit and all other embedded items are properly located in relation to concrete paving. Verify all grades for pitch and fall prior to pouring pavements.
2. Verify that all cross-fall and ramp criteria comply with Title 24 requirements.

#### B. Placement

1. Install all natural and color concrete paving per Section 303-5 and Section 303-7 of the SSPWC respectively, as specified and as shown on drawings.
2. Install all curbing, cross gutters, and related improvements per Section 303-5 of the SSPWC, as specified herein, and as shown on drawings. Where machine formed curbing is provided, tolerances and joint control specified for fixed form construction shall be met.

#### C. Finishing

1. Broom Finish shall be applied to sidewalks, dock areas and entrance door stoops.
2. Float and steel trowels to required slopes and planes. Apply broom texture, transverse to direction of pedestrian travel, and using a stiff wire or nylon bristle broom. Broom finish texture to be approved by City for various applications.
3. Provide handicapped access ramp finish per City of San Diego Standard Drawings.

#### D. Joint Treatment

1. Provide construction, expansion, and weakened plane joints as required by RSD for sidewalks, curbs and concrete pavement areas.
2. Hold expansion joint filler material below paving surface minimum 1/2 inch with zip strip on top of joint filler material.
3. Properly prepare edges of joints prior to proceeding with subsequent operations. Remove all contaminants laitance, oil and other deleterious substances prior to installing joint sealant.
4. Install joint sealant at all expansion joints per manufacturer's recommendations. Provide bond breaker at expansion joint filler. Tool joint sealant concave. Remove excess from joint edges.

### 3.4 CONCRETE CURING

#### A. General

1. Concrete curing shall conform with Section 303-5.6 of the SSPWC for natural concrete and Section 303-7.4 of the SSPWC for colored concrete.

### 3.5 TRUNCATED DOMES

- A. Cast-in-place installation: verify cast-in-place concrete surface condition with the Engineer prior to installation. Install truncated domes per manufacturer's installation instructions.



- B. Surface applied installation: Grind and prepare the existing concrete surface and verify the surface condition with the Engineer prior to installation. Install truncated domes per manufacturer's installation instruction.
- C. Contractor shall not remove plastic protective cover from the tile panels until its installation. Any damaged tile panels shall be replaced at Contractors own cost.

### 3.6 FIELD QUALITY CONTROL

- A. Inspection and Testing
  - 1. Evaluate surfaces for grade and drainage. Correct all non-conforming surfaces, ponds and other irregularities to the satisfaction of the City.

### 3.7 ALLOWABLE TOLERANCES

- A. General
  - 1. Variations below list the maximum permissible deviations form established lines, grades and dimensions for all exposed concrete paving.
- B. Variation from Plumb
  - 1. In the lines and surfaces of pavements: In 10 feet, maximum 1/4 inch.
  - 2. For exposed corners, control-joint grooves and other conspicuous lines.
    - a. In any 10 feet, maximum 1/4 inch
    - b. In any 20 feet or more, 1/2 inch
- C. Variation from the Level or from the Grades shown per Drawings:
  - 1. In pavements, tops of curbing, exposed joints and other conspicuous lines:
    - a. In any 10 feet, 1/4 inch maximum.
- D. Variation in Cross-Sectional Thickness of Slabs, without reducing tolerances established for line, plumb and level.
  - 1. Minus 1/4 inch, plus 1/2 inch.

### 3.8 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Comply with ACI 306.1 for cold-weather protection.
- C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

**END OF SECTION 32 13 13**



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## SECTION 32 16 13 - CONCRETE CURBS AND GUTTERS

### PART 1 - GENERAL

#### 1.1 SUMMARY OF WORK

- A. The scope of work in this section includes concrete curbs and gutters, rolled curbs, cross gutters, ribbon gutters, barrier and median curbs including but not limited to the preparation of subgrade, forms, joints, finishing, curing, and other appurtenant work as shown on the drawings and specified herein.

#### 1.2 REFERENCE STANDARDS

- A. Standard Specifications
  - 1. Standard Specifications for Public Works Construction (SSPWC), 2015 Edition (Green Book), including the Regional Supplement.
  - 2. State of California, Department of Transportation, Standard Specifications, 2015.
- B. Standard Drawings
  - 1. San Diego Regional Standard Drawings (2016).
- C. American Society for Testing and Materials (ASTM):
  - 1. ASTM A53 Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
  - 2. ASTM A615 Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
  - 3. ASTM A663 Specification for Steel Bars, Carbon, Merchant Quality, Mechanical Properties
  - 4. ASTM C260 Specification for Air-Entraining Admixtures for Concrete
  - 5. ASTM C309 Specification for Liquid Membrane-Forming Compounds for Curing Concrete
  - 6. ASTM C881 Specification for Epoxy-Resin-Base Bonding Systems for Concrete
- D. American Concrete Institute (ACI):
  - 1. ACI 117 Standard Specification for Tolerances for Concrete Construction Materials
  - 2. ACI 301 Standard Specifications for Structural Concrete
  - 3. ACI 318 Building Code Requirements for Reinforced Concrete

#### 1.3 SUBMITTALS

- A. Product Data: Submit the respective manufacturer's product data for manufactured products.
- B. Submit concrete mix design for approval



#### 1.4 QUALITY ASSURANCE

- A. Tolerances:
  - 1. Construct concrete surfaces within 1/4 inch of the indicated elevation, and deviating not more than 1/8 inch from a 10-foot straightedge placed anywhere on the surface.
  - 2. Slab tolerances shall be “straightedge tolerance” as specified in ACI 117.
- B. Finishes: Slab finishes shall be as specified herein in accordance with the requirements of ACI 301.

### **PART 2 - MATERIALS**

#### 2.1 MATERIALS AND ACCESSORIES

- A. Materials for concrete curb and gutters shall be per Section 201 of the SSPWC and the applicable Regional Standard Drawings and as detailed on the Drawings.
- B. Concrete strength for concrete curb and gutter and median curb shall be 520-C-2500 minimum.

### **PART 3 - PART 3 - EXECUTION**

#### 3.1 PREPARATION OF SUBGRADE

- A. Excavate for and prepare the sub grade as specified in Section 312200 - Grading, true to the indicated grade and cross section.
- B. Test completed sub grade for correct grade and cross section by means of template supported on side forms.
- C. Dampen sub grade and forms just before placing concrete.

#### 3.2 TYPES OF CONSTRUCTION

- A. Provide cast-in-place concrete construction, plain or reinforced as indicated.
- B. Curbs and gutters shall be formed accurately to indicated section profile with template screed.
- C. Extruded curbs and gutter, placed by an extrusion machine, may be provided where site conditions are suitable and the extrusion process is appropriate for the purpose.

#### 3.3 JOINTS

- A. Expansion Joints:
  - 1. Construct 3/8-inch to 1/2-inch thick expansion joints in the following locations:
    - a. In curb and combination curb and gutter at the locations of expansion joints in the concrete roadway.



- b. In curb or combination curb and gutter, at points where curved and tangent sections join.
  - c. Between curb or combination curb and gutter, and any drain inlet or similar structure occurring within the limits of the curb or combination curb and gutter.
  - d. At corners in sidewalks, following the projections of the building lines from the corner of the building to the curb.
  - e. Between sidewalks and any permanent structure.
  - f. Between sidewalk and curb.
  - g. Through sidewalks at intervals not greater than 15 feet.
  - h. In sidewalks, encircling fixtures more than 12 inches in diameter.
2. Construct expansion joints as specified, except that load transfer devices will not be required unless indicated. Shape preformed filler to cross section of curbs and combination curb and gutter.
- B. Contraction Joints: In curbs and curbs and gutters, provide contraction joints as indicated in uniform intervals not greater than 6 feet, with the edges rounded to a 1/4-inch to 3/8-inch radius.
- C. Tooling: Finish joints with an edging tool having 1/4-inch to 3/8-inch radius, leaving joints free of mortar and concrete. In preformed type joints, leave joint filler material exposed for full length of joint with clean and true edges.
- D. Joint Sealing:
- 1. Seal to within 1/8 inch of pavement surface joints in curbs and gutters, including gutter surfaces of combination curb and gutter sections; all joints between curbs and vehicular pavement; all joints between gutters and vehicular pavement; and all other expansion joints. Do not seal other joints unless so indicated.
  - 2. Do not seal joints until concrete curing is complete. Prior to installation of the joint sealing compound, clean the joints of dirt and other foreign material. Joints may be cleaned with compressed air jets provided that the air in such jets is free of oil or water. Do not fill joints when there is any free water in or adjacent to the joints. Joint walls and all surfaces to which the sealing material is to adhere shall be surface dry for at least three hours prior to sealing.
  - 3. Apply with approved pressurized equipment. Perform sealing of joints to make them impervious to water and to prevent the sealing compound from spreading over the surface of the pavement.

### 3.4 FORM REMOVAL

- A. Remove front curb forms and all other forms not less than two nor more than six hours after placing concrete, but in no case while the concrete is still plastic enough to slump.

### 3.5 FINISHING

- A. Curb and Combination Curb and Gutter:
  - 1. Trowel the face of curb smooth to a depth of not less than 2 inches below the flow line, or to the flow line of integral curb and gutter, and finish with a steel trowel, all immediately after removal of front curb forms.
  - 2. Finish all curb edges with a radius of 1/2-inch.



3. Provide a final fine brush finish to both top and face of curb with brush strokes parallel to the line of the curb, so that both top and front face present the same uniform appearance.
  4. Keep the curb face wet during above finishing operations.
  5. Allow no coarse aggregate to show on the finished curb surface.
- B. Joints and Edges: As soon as the condition of the work permits, perform joint work, edging, and marking. Finish all edges with a radius of 1/4 inch to 3/8 inch.
- 3.6 CURING AND PROTECTION
- A. Comply with the applicable requirements of Section 303-5 of the SSPWC.
  - B. Do not permit construction equipment adjacent to concrete curb and gutter until the seventh day following the placement of concrete.
- 3.7 FIELD QUALITY CONTROL
- A. The Contractor shall perform inspections and tests as specified in Section 201- 1.1.5 of the SSPWC, and shall provide such samples and services to facilitate the testing.

**END OF SECTION 32 16 13**





## SECTION 32 17 23 - PAVEMENT MARKINGS

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK

- A. The work includes furnishing and applying pavement striping and markings, as shown on the drawings and as specified in these Technical Specifications.

#### 1.2 REFERENCE STANDARDS

- A. The following publications form part of this Section to the extent indicated by reference thereto. Where this Section exceeds the requirements of the publications listed below, the requirements of this Section shall govern. The publications are listed in order of precedence.
  1. Caltrans Manual of Uniform Traffic Control Devices
  2. City of San Diego White Book 2015.
  3. Standard Specifications for Public Works Construction “Greenbook” (SSPWC), 2015 Edition, including the Regional Supplement.
  4. Caltrans Standard Specifications, referred to hereinafter as CALTRANS.
  5. City of San Diego Regional Standard Drawings, referred to hereinafter as RSD.

#### 1.3 SUBMITTALS

- A. Contractor shall submit catalog cuts of all proposed materials for Engineer's review and approval.
  1. Certificates of Compliance from the suppliers of the proposed paint, glass beads, and pavement markers.
  2. Certified test reports for the paint. The reports shall not be interpreted as acceptance of the products by the Engineer, and paint shall not be applied prior to written approval of the Engineer.

### PART 2 - PART 2 - PRODUCTS

#### 2.1 PAINT

- A. Paint for traffic striping and markings shall be commercial grade rapid dry water borne white, yellow, black, red, blue and green paint as applicable. In addition, white, yellow, and black paint shall conform to CALTRANS Section 84-3.
- B. Paint for stop bars and delineation bands shall be thermoplastic paint conforming to CALTRANS Section 84-2, “Thermoplastic Traffic Stripes and Pavement Markings.”

#### 2.2 TEMPORARY PAVEMENT MARKINGS

- A. Temporary marking and striping shall be installed using temporary removable pavement marking tabs.



2.3 GLASS BEADS

- A. Glass beads shall conform to the State Specification No. 8010-51J-22 Type II and CALTRANS Section 84-3.02.

2.4 STENCILS

- A. Stencils for pavement striping and marking shall be 1/8" minimum thickness sheet metal.

**PART 3 - EXECUTION**

3.1 GENERAL

- A. All work of PAVEMENT MARKINGS AND STRIPING shall conform to City of San Diego White Book 2015 Section 310-5.6.1, SSPWC Section 310-5.6, CALTRANS, and these Technical Specifications.
- B. Contractor shall apply (3) three coats of paint. The first coat shall be applied as soon as the AC overlay has cured per these specifications. The second coat shall be installed a minimum of 2 weeks and maximum of 4 weeks after the first coat. The third coat shall be installed after the second coat has been allowed to thoroughly dry/cure.
- C. All construction related mark-outs, including utility mark-outs shall be removed upon completion of job.

3.2 PREPERATION OF WORK AREA

- A. Preperation
  - 1. The pavement surface to receive striping and marking shall be cleaned of all dirt and debris which shall be disposed of outside Tidelands.
  - 2. Paint shall not be applied until the layout and condition of the pavement surface have been approved by the Engineer. Contractor shall provide “cat-track” or “turkey track” markings for layout approval prior to paint application.
  - 3. Asphalt concrete overlay shall be allowed to cure at least 24 hours before any coat of paint is applied.
- B. Temporary Pavement Striping
  - 1. Contractor shall provide temporary pavement striping by adhering temporary markers to pavement surfaces immediately following completion of paving operations and prior to opening of pavement to traffic.
  - 2. The temporary markers shall be along the designed layout of permanent striping, and shall be maintained in place until the permanent striping has been applied. Temporary markers shall be removed and disposed of following completion of permanent striping application.
- C. Removal of Existing Traffic Markings
  - 1. Removal of all existing or temporary traffic markings and lines shall be in accordance with City of San Diego White Book 2015, Section 310-5.6.1.



### 3.3 APPLICATION

- A. Markings on pavement and curbs shall be applied at the locations and to the dimensions and spacing shown on the drawings. Mechanical means shall be used to paint traffic stripes and pavement markings, and to apply glass beads.
- B. Paint shall be mixed in accordance with the manufacturer's instructions and applied to the pavement with a marking machine with a minimum wet film thickness of 15 mils. Thinner shall not be used in the paint. Width of markings shall match existing markings and striping.
- C. Unless otherwise directed by the Engineer, glass beads shall be uniformly incorporated in all coats of paint concurrently with the application of the paint, except that glass beads shall not be applied to black paint. Beads shall be embedded in the coat of traffic paint being applied to a depth of one-half their diameters, and shall be applied at an approximate rate of 5 pounds per gallon of paint. The exact rate will be determined by the Engineer. The amount of glass beads applied shall be measured by stabbing the glass bead tank with a calibrated rod.
- D. Edges of markings shall not vary from a straight line more than 1/2 inch in 50 feet, and dimensions shall be within a tolerance of plus or minus five percent.
- E. Painting shall be performed only on a dry surface when the atmospheric temperature is above 50° F. and when the weather is not foggy or windy, or humid in the judgment of the Engineer.
- F. Contractor shall utilize a mechanical marker machine which shall be an atomizing spray-type suitable for application of traffic paint, and designed to apply markings of uniform cross-sections and clear cut edges without running or spattering. Stencils and hand spray equipment shall be used to paint letters and symbols on pavement.

**END OF SECTION 32 17 23**



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## SECTION 32 31 13 - CHAIN LINK FENCES AND GATES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Special Supplementary Provisions and 2015 Green Book and White Book General Provisions, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Chain-link fences.
  - 2. Horizontal-slide, motor-operated gates.

#### 1.3 QUALITY ASSURANCE

- A. Emergency Access Requirements: According to requirements of authorities having jurisdiction for gates with automatic gate operators serving as a required means of access.

#### 1.4 FIELD CONDITIONS

- A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

### PART 2 - PRODUCTS

#### 2.1 CHAIN-LINK FENCE FABRIC

- A. General: Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist according to "CLFMI Product Manual" and requirements indicated below:
  - 1. Fabric Height: As indicated on Drawings.
  - 2. Steel Wire for Fabric: Wire diameter of 0.148 inch.
    - 1. Mesh Size: 2 inches.
    - 2. Zinc-Coated Fabric: ASTM A 392, Type II, Class 2, 2.0 oz./sq. ft. with zinc coating applied weaving.
    - 3. Coat selvage ends of metallic-coated fabric before the weaving process with manufacturer's standard clear protective coating.
  - 3. Selvage: Twisted top and knuckled bottom.

#### 2.2 HORIZONTAL-SLIDE GATES

- A. General: ASTM F 1184 for gate posts and single sliding gate types. Provide automated vehicular gates according to ASTM F 2200.



- B. Pipe and Tubing:
  - 1. Aluminum: ASTM B 429/B 429M; manufacturer's standard finish.
  - 2. Gate Posts: ASTM F 1184. Provide rectangular tubular aluminum posts.
  - 3. Gate Frames and Bracing: Rectangular tubular aluminum.
- C. Frame Corner Construction: Welded.
- D. Extended Gate Posts and Frame Members: Extend gate posts and frame end members above top of chain-link fabric at both ends of gate frame 16 inches as required to attach barbed tape assemblies.
- E. Hardware:
  - 1. Hangers, Side Roller Assemblies, and Stops: Fabricated from galvanized steel. Provide

### 2.3 FITTINGS

- A. Post Caps: Provide for each post.
  - 1. Provide line post caps with loop to receive tension wire or top rail.
- B. Truss Rod Assemblies: rod and turnbuckle or other means of adjustment.
- C. Tie Wires, Clips, and Fasteners: According to ASTM F 626.
  - 1. Standard Round Wire Ties: For attaching chain-link fabric to posts, rails, and frames, according to the following:
    - 1. Hot-Dip Galvanized Steel: 0.148-inch- diameter wire; galvanized coating thickness matching coating thickness of chain-link fence fabric.
    - 2. Aluminum: ASTM B 211; Alloy 1350-H19; 0.192-inch- diameter, mill-finished wire.
- D. Finish:
  - 1. Metallic Coating for Pressed Steel or Cast Iron: Not less than 1.2 oz./sq. ft. of zinc.
    - 1. Polymer coating over metallic coating.
  - 2. Aluminum: Mill finish.

### 2.4 BARBED TAPE

- A. Wire-Reinforced Tape: ASTM F 1910; continuous coils with four-point, needle-sharp barbs permanently cold clenched around a core wire.
  - 1. Core Wire: High-tensile-strength, stainless steel.

### 2.5 GATE OPERATORS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide HySecurity SlideDriver 30F or comparable product by one of the following:
  - 1. Eagle Access Control Systems, Inc.
  - 2. Tymetal Corp.
- B. UL Standard: Manufacture and label gate operators according to UL 325.
- C. Motors: Comply with NEMA MG 1.



1. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.
  2. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.
  3. Service Factor: 1.15.
  4. Electrical Characteristics:
    1. Horsepower: 2.
    2. Voltage: 208 V ac, single phase, 60 hertz.
    3. Voltage: 208 V ac, three phase, 60 hertz.
- D. Operating Features:
1. Digital Microprocessor Control: Electronic programmable means for setting, changing, and adjusting control features. Provide unit that is isolated from voltage spikes and surges.
  2. System Integration: With controlling circuit board capable of accepting any type of input from external devices.
- E. Fire and Emergency Access Lock Box
1. Provide lock box permitting operation of the Gate Operator by opening Lock Box
  2. In event of power failure, provide Cable Release Handle in Lock Box to disengage the drive wheels from the drive rail.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for a certified survey of property lines and legal boundaries, site clearing, earthwork, pavement work, and other conditions affecting performance of the Work.
  1. Do not begin installation before final grading is completed unless otherwise permitted by City.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

#### 3.3 CHAIN-LINK FENCE INSTALLATION

- A. Install chain-link fencing according to ASTM F 567 and more stringent requirements specified.
  1. Install fencing on established boundary lines inside property line.
- B. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacing indicated, in firm, undisturbed soil.



- C. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.
  - 1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
  - 2. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.
- D. Terminal Posts: Install terminal end, corner, and gate posts according to ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment of 15 degrees or more. For runs exceeding 500 feet, space pull posts an equal distance between corner or end posts.
- E. Line Posts: Space line posts uniformly at 96 inches o.c.
- F. Post Bracing and Intermediate Rails: Install according to ASTM F 567, maintaining plumb position and alignment of fence posts. Diagonally brace terminal posts to adjacent line posts with truss rods and turnbuckles. Install braces at end and gate posts and at both sides of corner and pull posts.
  - 1. Locate horizontal braces at midheight of fabric 72 inches or higher, on fences with top rail, and at two-third fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.
- G. Tension Wire: Install according to ASTM F 567, maintaining plumb position and alignment of fence posts. Pull wire taut, without sags. Fasten fabric to tension wire with 0.120-inch-diameter hog rings of same material and finish as fabric wire, spaced a maximum of 24 inches o.c. Install tension wire in locations indicated before stretching fabric. Provide horizontal tension wire at the following locations:
  - 1. Extended along and bottom of fence fabric. Install top tension wire through post cap loops. Install bottom tension wire within 6 inches of bottom of fabric and tie to each post with not less than same diameter and type of wire.
  - 2. Extended along top of extended posts and top of fence fabric to support barbed tape.
  - 3. As indicated on Drawings.
- H. Top Rail: Install according to ASTM F 567, maintaining plumb position and alignment of fence posts. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended in writing by fencing manufacturer.
- I. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Leave 2-inch bottom clearance between finish grade or surface and bottom selvage unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.
- J. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at one end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain-link fabric according to ASTM F 626. Bend ends of wire to minimize hazard to individuals and clothing.
  - 1. Maximum Spacing: Tie fabric to line posts at 12 inches o.c. and to braces at 24 inches o.c.
- K. Fasteners: Install nuts for tension bands and carriage bolts on the side of fence opposite the fabric side. Peen ends of bolts or score threads to prevent removal of nuts.





- L. Barbed Tape: Install according to ASTM F 1911. Install barbed tape uniformly in configurations indicated and fasten securely to prevent movement or displacement.

#### 3.4 GATE INSTALLATION

- A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation.

#### 3.5 GATE-OPERATOR INSTALLATION

- A. Install gate operators according to manufacturer's written instructions, aligned and true to fence line and grade.
- B. Excavation: Hand-excavate holes for posts, pedestals, and equipment bases/pads, in firm, undisturbed soil to dimensions and depths and at locations according to gate-operator component manufacturer's written instructions and as indicated.
- C. Ground electric-powered motors, controls, and other devices according to NFPA 70 and manufacturer's written instructions.

#### 3.6 ADJUSTING

- A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.
- B. Automatic Gate Operator: Energize circuits to electrical equipment and devices, start units, and verify proper motor rotation and unit operation.

#### 3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train the City's maintenance personnel to adjust, operate, and maintain chain-link fences and gates.

**END OF SECTION 32 31 13**



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## SECTION 33 05 13 - ADJUSTING UTILITY STRUCTURES TO GRADE

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Reference Standards
  - 2. Submittals
  - 3. General Part
  - 4. Adjustment
  - 5. Traffic Bearing Capacity
- B. Related Requirements
  - 1. Drawings and general provisions of the Contract, including General and Special Supplementary Provisions and 2015 Green Book and White Book General Provisions, apply to this Section.
- C. Description
  - 1. The work includes adjusting tops of all utility and storm drain access structures to finish grade within project limits, as specified in this Section, and as shown on plans.

#### 1.2 REFERENCE STANDARDS

- A. The following publications form part of this Section to the extent indicated by reference thereto. Where this Section exceeds the requirements of the publications listed below, the requirements of this Section shall govern. The publications are listed in order of precedence.
  - 1. City of San Diego Regional Standard Drawings, referred to hereinafter as RSD.
  - 2. Caltrans Standard Specifications, referred to hereinafter as CALTRANS

#### 1.3 SUBMITTALS

- A. Contractor shall submit catalog cuts of all proposed materials for Engineer's review and approval.

### PART 2 - PRODUCTS

#### 2.1 GENERAL

- A. Products to be used under this Section shall be similar in character to those in the original construction, shall meet the latest industry standards or better, and shall conform to the provisions in latest federal, state, and local codes and regulations.



**PART 3 - EXECUTION**

3.1 ADJUSTMENT

- A. Adjustment of all existing frames, utility structures, valve boxes and covers, grates, cleanouts, irrigation meters, water meters, handholes, inlets, and manholes to finished grade within project limits shall conform to CALTRANS Section 15-2.05A, as shown on plans and as these Technical Specifications.

3.2 TRAFFIC BEARING CAPACITY

- A. In no case shall the structural capacity of the resulting cover, grate or supporting structure be less than that required for H-20 truck traffic loading when located in traffic areas.

**END OF SECTION 33 05 13**



## SECTION 34 41 30 - ROADSIDE SIGNS

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK

- A. The work includes the supply and installation of regulatory, information, and guide signs as necessary to complete contract work as shown on the drawings and as specified in these technical specifications.

#### 1.2 REFERENCE STANDARDS

- A. The following publications form part of this Section to the extent indicated by reference thereto. Where this Section exceeds the requirements of the publications listed below, the requirements of this Section shall govern. The publications are listed in order of precedence.
  1. Caltrans Manual of Uniform Traffic Control Devices, referred to hereinafter as MUTCD
  2. City of San Diego Regional Standard Drawings, referred to hereinafter as RSD
  3. Caltrans Standard Plans

#### 1.3 SUBMITTALS

- A. Contractor shall submit catalog cuts of all proposed materials for Engineer's review and approval.

### PART 2 - PRODUCTS

#### 2.1 GENERAL

- A. Products to be used under this Section shall meet the latest industry standards or better, and shall conform to the provisions in latest federal, state, and local codes and regulations.

### PART 3 - EXECUTION

#### 3.1 GENERAL

- A. All work of ROADSIDE SIGNS shall conform to MUTCD and this section.

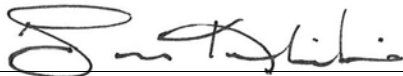
**END OF SECTION 34 41 30**



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**ASBESTOS CONTAINING MATERIALS**  
**ABATEMENT SPECIFICATION**  
**for**  
**FIRE STATIONS 3, 8, 15**  
**January 3, 2017**

Prepared by:



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## I. GENERAL REQUIREMENTS

### A. DESCRIPTION OF WORK

1. ABATEMENT CONTRACTOR shall supply all labor, transportation, material, apparatus, and equipment for the removal, and disposal of asbestos-containing materials (ACM) to be impacted as a result of this project, as identified in Appendix C of this section. A summary of asbestos containing materials in each Fire Station follows:

a) Fire Station 15

(1) 9"x9" Vinyl Floor Tile with Mastic was found to be asbestos containing throughout the Station.

(2) Roofing material was not tested but is assumed as asbestos containing unless testing proves otherwise

b) Fire Station 8

(1) Carpet Mastic was found to be asbestos containing throughout the Station

(2) Roofing material was not tested but is assumed as asbestos containing unless testing proves otherwise

c) Fire Station 3

(1) Vinyl Sheet Flooring and associated mastics were found to be asbestos containing throughout the Station, excluding the 2<sup>nd</sup> floor Restroom 2 (S.E. restroom).

(2) Roofing material was not tested but is assumed as asbestos containing unless testing proves otherwise

2. ABATEMENT CONTRACTOR shall be responsible for ensuring the building will not be contaminated with asbestos containing material during work and shall be responsible for any clean-up determined necessary by City of San Diego's PROJECT MONITOR.

3. Before submitting his/her bid, the ABATEMENT CONTRACTOR shall visit the project site and verify the location of the asbestos-containing materials that will be removed under the terms and conditions of the contract and this specification.

4. Abatement work shall be performed within agreed upon hours submitted prior to project start which will not include designated City holidays.

5. Before the beginning of the work related to asbestos abatement, ABATEMENT CONTRACTOR shall hold a safety construction meeting with all asbestos related supervisors, workers, and other contractors on-site that provides an overview of the accepted asbestos work plan, decontamination procedures specific to this project (decontamination procedures shall be on paper with copies for all

present), and disposal plan for this project. Meeting shall include the PROJECT MONITOR and any other designated City representative.

B. CONTRACTOR USE OF THE PREMISES

1. All site rules and regulations affecting the work should be complied with while engaged in project activities. The existing building should be maintained in a safe condition throughout the asbestos abatement activities. The ABATEMENT CONTRACTOR will be responsible for adhering to all applicable building codes and fire safety requirements.

2. All public areas will be kept free of accumulated waste, materials, rubbish, and debris.

C. PROJECT COORDINATION

1. It will be the responsibility of the ABATEMENT CONTRACTOR to coordinate all site activities with the City's Asbestos & Lead Management Program's (ALMP) PROJECT MONITOR including any meetings, surveys, special reports, and site usage limitations.

D. PROJECT SUBMITTALS

The ABATEMENT CONTRACTOR shall not commence any work until approval has been given from the City. The ABATEMENT CONTRACTOR shall submit the following at least 60 days prior to commencement of any asbestos abatement activities:

1. Asbestos Abatement Work Plan:

a) In addition to information required in this section, Work Plan shall contain all information required under Title 8 CCR 1529. Submit a detailed job-specific plan that includes:

(1) The procedures proposed to comply with the requirements of this specification and all applicable regulations.

(2) Detailed drawings that identify the location, size, layout and details of the Work Areas, any equipment, disposal storage, restrooms, and worker decontamination facilities.

(3) The sequencing of abatement work and the interface of trades involved in the performance of work. Provide a time line that details each major phase of work activity and anticipated time it will occur.

(4) The methods to be used to assure the safety of occupants and visitors to the site.

(5) Detailed description of the methods to be employed to ensure asbestos is not released above background air levels.

(6) The method of removal to minimize asbestos dust generation in the Work Area,

b) Work site coordination submittals including:

- (1) Contingency and Spill Plan: Prepare a contingency plan for emergencies including fire, accident, power failure, or any other event that may require modification or abridgement of decontamination or Work Area isolation procedures. Include in plan specific procedures for decontamination or Work Area isolation. Plan should be specific for all types of hazardous materials or situations specific to this work site. Note that nothing in this specification should impede safe exiting or providing of adequate medical attention in the event of an emergency.
  - (2) Telephone numbers and locations of emergency services including but not limited to fire, ambulance, doctor, hospital, police, power company, telephone company.
2. Notifications:
  - a) If required by regulations, submit copies of notifications made to regulatory agencies along with a copy of certified mail receipt.
  - b) Notify emergency service agencies including fire, ambulance, police or other agency that may service the abatement work site in case of an emergency. Notification is to include methods of entering Work Area, emergency entry and exit locations, modifications to fire notification or fire-fighting equipment, and other information needed by agencies providing emergency services.
  - c) Notifications of Emergency: Any individual at the job site may notify emergency service agencies if necessary without effect on this contract or the Contract Sum.
  - d) Provide submittal identifying person responsible for responding to project site emergencies twenty-four hours a day, seven days a week.
3. ABATEMENT CONTRACTOR qualifications and personnel information submittals that include but are not limited to:
  - a) Submit a copy of the ABATEMENT CONTRACTOR's Asbestos DOSH Handling License.
  - b) Identify state licensed transporter, disposal location, and associated permits for all asbestos waste.
  - c) Provide all staff names, certifications, and experience. Identify their duties and responsibilities on this project. ABATEMENT CONTRACTOR shall have the following minimum levels of qualified supervision on the project site:
    - (1) General Superintendent: Provide a full-time General Superintendent who is experienced in administration and supervision of asbestos abatement projects including work practices, protective measures for building and personnel, disposal procedures, etc. This person is the ABATEMENT CONTRACTOR`s representative responsible for compliance with all applicable federal, state and local

regulations and guidelines, particularly those relating to asbestos abatement and hazardous waste. Should, in the opinion of the OWNER, any language barrier exist between the on-site superintendent and the OWNER or PROJECT MONITOR, the ABATEMENT CONTRACTOR shall employ a qualified full-time interpreter or provide a new on-site superintendent at no additional cost to the OWNER. Shall be AHERA certified as asbestos supervisor.

(2) Foreman: Provide a full time Foreman to directly supervise and direct no more than 10 abatement workers. Each Foreman will act as the Competent Person as required by Title 8 CCR 1529 for the workers the foreman is directing. The Foreman has oversight authority over the workers and reports to the General Superintendent. If there are 10 or fewer abatement workers on the project the General Superintendent may fill the Foreman's position. Shall be AHERA certified as asbestos supervisor.

(3) Experience and Training: The General Superintendent and foreman shall meet all the requirements as a Competent Person as required by Title 8 CCR 1529. They shall have completed training in EPA Asbestos Supervisor Training. They shall have experience with projects of similar types and sizes.

(4) Workers: All asbestos abatement workers shall have current EPA and OSHA asbestos abatement training.

(5) Certificate of Worker's Acknowledgment: Submit an original signed copy of the Certificate of Worker's Acknowledgment found in Appendix A of this section, for each worker and supervisor who is to be at the job site or enter the Work Area.

d) Submit respiratory protection information and air monitoring data as per the following:

(1) Operating Instruction: Submit complete operating and maintenance instructions for all components and systems as a whole. Submittal is to be in bound manual form suitable for field use.

(2) Respiratory Protection Program: Submit ABATEMENT CONTRACTOR's written respiratory protection program manual as required by Title 8 CCR 1529 and 5144.

(3) Respiratory Protection Schedule: Submit level of respiratory protection intended for each operation required by the project.

(4) Copies of current respirator fit test: Fit tests must be performed every 6 months.

e) Submit doctor's report from medical examination conducted within the last 12 months as part of compliance with OSHA medical surveillance requirements for each worker who is to enter the Work Area. Submit, at a minimum, the following for each worker:

- (1) Name and Social Security Number
- (2) Physicians Written Opinion from examining physician including at a minimum the following:
  - (a) Whether worker has any detected medical conditions that would place the worker at an increased risk of material health impairment from exposure to asbestos. Any recommended limitations on the worker or on the use of personal protective equipment such as respirators.
  - (b) Statement that the worker has been informed by the physician of the results of the medical examination and of any medical conditions that may result from asbestos exposure.
- f) Submit a notarized certification, signed by an officer of the ABATEMENT CONTRACTOR firm that exposure measurements, medical surveillance, and worker training records are being kept in conformance with Title 8 CCR 1529.
- g) Identify the laboratory that will be performing the analysis of the personal samples and provide their accreditation. Also discuss the method by which the ABATEMENT CONTRACTOR will provide the analytical results to the PROJECT MONITOR within 24 hours of sampling completion.
- 4. Submit the following during and at the completion of the work
  - a) Copies of all Waste Shipment Records
  - b) Copies of all air monitoring results within 24 hours
- 5. At the end of a project, the ABATEMENT CONTRACTOR shall submit the following to the PROJECT MONITOR:
  - a) Personal Air Sample Results
  - b) Copies of Project Daily Logs
  - c) Containment Entry/Exit Logs
  - d) Waste Disposal Documentation
  - e) Certificate of Visual Inspection

E. SCHEDULES AND REPORTS

- 1. Prior to each phase of project, the ABATEMENT CONTRACTOR shall provide the City with a tentative time line which outlines the project schedule. These documents will be reviewed and approved by the City prior to the commencement of work.

F. PRODUCT DATA

- 1. The ABATEMENT CONTRACTOR shall submit product information that is to be used during the abatement activities prior to commencement of work (i.e., encapsulants). General information required includes manufacturer's standard

printed recommendations for application and use, compliance with recognized standards of trade association and testing agencies, and safety data sheets (SDSs).

2. Polyethylene sheet

a) A single polyethylene film in the largest sheet size possible to minimize seams, 4.0 or 6.0 mil thick as indicated, and clear, frosted, or black as indicated.

b) Provide flame resistant polyethylene film that conforms to requirements set forth by the National Fire Protection Association Standard 701, Small Scale Fire Test for Flame-resistant Textiles and Films. Provide largest size possible to minimize seams, 4.0 or 6.0 mil thick as indicated, and frosted or black as indicated.

c) Reinforced Polyethylene Sheet: Where plastic sheet is the only separation between the Work Area and building exterior, provide translucent, nylon reinforced, laminated, flame resistant, polyethylene film that conforms to requirements set forth by the National Fire Protection Association Standard 701, Small Scale Fire Test for Flame-resistant Textiles and Films. Provide largest size possible to minimize seams, 4.0 or 6.0 mil thick as indicated, frosted or black as indicated.

3. Tape

a) Provide duct tape in 2" or 3" widths as indicated, with an adhesive which is formulated to stick aggressively to sheet polyethylene.

4. Spray adhesive

a) Provide spray adhesive in aerosol cans which is specifically formulated to stick tenaciously to sheet polyethylene.

G. PROJECT CLOSE-OUT

1. Upon completion of work and prior to payment, the PROJECT MONITOR will proceed with an initial inspection of the abatement work area. A Certificate of Visual Inspection (Appendix B) will be signed by both the ABATEMENT CONTRACTOR and PROJECT MONITOR. The ABATEMENT CONTRACTOR will not be paid until the area meets the established project-specific clearance criteria and has submitted the required information.

## II. DEFINITIONS

A. ABATEMENT: Any set of measures designed to permanently eliminate lead based paint hazards including paint removal, building component removal, or near-permanent enclosure of lead based paint hazards.

B. ABATEMENT CONTRACTOR: The designated sub-contractor performing the required abatement work outlined in this specification.

- C. ACCREDITED or ACCREDITATION (when referring to a person or laboratory): A person or laboratory accredited in accordance with section 206 of Title II of the Toxic Substances Control Act (TSCA).
- D. AIR MONITORING: The process of measuring the fiber content of a specific volume of air.
- E. AMENDED WATER: Water to which a surfactant has been added to decrease the surface tension to 35 or less dynes.
- F. ASBESTOS: The asbestiform varieties of serpentinite (chrysotile), riebeckite (crocidolite), cummingtonite grunerite, anthophyllite, and actinolite tremolite. For purposes of determining respiratory and worker protection both the asbestiform and non-asbestiform varieties of the above minerals and any of these materials that have been chemically treated and/or altered shall be considered as asbestos.
- G. ASBESTOS CONTAINING MATERIAL (ACM): Any material containing more than 1% by weight of asbestos of any type or mixture of types.
- H. ASBESTOS-CONTAINING BUILDING MATERIAL (ACBM): Surfacing ACM, thermal system insulation ACM, or miscellaneous ACM that is found in or on interior structural members or other parts of a building.
- I. ASBESTOS CONTAINING WASTE MATERIAL: Any material which is or is suspected of being or any material contaminated with an asbestos containing material which is to be removed from a work area for disposal.
- J. ASBESTOS DEBRIS: Pieces of ACBM that can be identified by color, texture, or composition, or means dust, if the dust is determined by an accredited inspector to be ACM.
- K. AUTHORIZED VISITOR: The Owner, the Owner's Representative, testing lab personnel, the Architect/Engineer, emergency personnel or a representative of any federal, state and local regulatory or other agency having authority over the project.
- L. BARRIER: Any surface that seals off the work area to inhibit the movement of fibers.
- M. BREATHING ZONE: A hemisphere forward of the shoulders with a radius of approximately 6 to 9 inches.
- N. DEMOLITION: The wrecking or taking out of any building component, system, finish or assembly of a facility together with any related handling operations.
- O. DISPOSAL BAG: A properly labeled 6 mil thick leak tight plastic bags used for transporting asbestos waste from work and to disposal site.

- P. ENCAPSULANT: A penetrating encapsulant specifically designed to minimize fiber release during removal of asbestos containing materials rather than for in situ encapsulation.
- Q. ENCAPSULATION: Treatment of asbestos containing materials, with an encapsulant.
- R. ENCLOSURE: The construction of an air tight, impermeable, permanent barrier around asbestos containing material to control the release of asbestos fibers into the air.
- S. FILTER: A media component used in respirators to remove solid or liquid particles from the inspired air.
- T. FRIABLE ASBESTOS MATERIAL: Material that contains more than 1.0% asbestos by weight and that can be crumbled, pulverized, or reduced to powder by hand pressure when dry. A material can also be rendered friable via mechanical means.
- U. HEPA FILTER: A High Efficiency Particulate Air (HEPA) filter capable of trapping and retaining 99.97% of asbestos fibers greater than 0.3 microns in diameter.
- V. HEPA FILTER VACUUM COLLECTION EQUIPMENT (or vacuum cleaner): High efficiency particulate air filtered vacuum collection equipment with a filter system capable of collecting and retaining asbestos fibers. Filters should be of 99.97% efficiency for retaining fibers of 0.3 microns or larger.
- W. NEGATIVE PRESSURE RESPIRATOR: A respirator in which the air pressure inside the respiratory inlet covering is positive during exhalation in relation to the air pressure of the outside atmosphere and negative during inhalation in relation to the air pressure of the outside atmosphere.
- X. PERSONAL MONITORING: Sampling of the asbestos fiber concentrations within the breathing zone of an employee.
- Y. PROTECTION FACTOR: The ratio of the ambient concentration of an airborne substance to the concentration of the substance inside the respirator at the breathing zone of the wearer. The protection factor is a measure of the degree of protection provided by a respirator to the wearer.
- Z. PROJECT MONITOR: City of San Diego Asbestos & Lead Management Program staff or their designated consultant.
- AA. VISIBLE EMISSIONS: Any emissions containing particulate asbestos material that are visually detectable without the aid of instruments. This does not include condensed uncombined water vapor.



- BB. WET CLEANING: The process of eliminating asbestos contamination from building surfaces and objects by using cloths, mops, or other cleaning utensils which have been dampened with amended water or diluted removal encapsulant and afterwards thoroughly decontaminated or disposed of as asbestos-contaminated waste.
- CC. WORK AREA: The area where asbestos-related work or removal operations are performed which is defined and/or isolated to prevent the spread of asbestos dust, fibers or debris, and entry by unauthorized personnel. Work area is a Regulated Area as defined by Title 8 CCR 1529

### III. SITE WORK

#### A. INTRODUCTION

This portion of the specification describes procedures and protocols for asbestos abatement activities. The protocols/procedures described hereafter are in accordance with federal/state/local requirements. In the absence of these requirements, the procedure/protocols are based on current industry standards.

#### B. BACKGROUND INFORMATION

Sampling of building materials has been performed by inspectors from the City's Asbestos and Lead Management Program (ALMP) and has been provided in Appendix C of this specification. If any materials to be impacted have not been previously tested contact ALMP for further sampling. Untested building materials must be assumed as asbestos containing and handled accordingly.

#### C. GENERAL INFORMATION

##### 1. Potential Asbestos Hazard

The disturbance of asbestos containing materials may cause exposure to workers and building occupants. All workers, supervisory personnel, subcontractors, and consultants who will be at the job site, need to be apprised of the seriousness of the hazard and of proper work practices which must be followed to minimize exposure. The procedures and methods described herein must be followed and the ABATEMENT CONTRACTOR must comply with all applicable federal/state/local requirements.

##### 2. Stop Work

If the PROJECT MONITOR presents a verbal or written stop work order, the ABATEMENT CONTRACTOR shall immediately and automatically stop all work. Recommencement of the work may not begin until authorized by the PROJECT MONITOR.

#### D. PROJECT ADMINISTRATION

##### 1. Certified Supervisor

The ABATEMENT CONTRACTOR needs to provide a full-time asbestos abatement supervisor who is experienced in administration and supervision of asbestos abatement projects including work practices, protective measures for building and personnel, disposal procedures, etc. This supervisor must have completed an "Asbestos Abatement Supervision" course. This person will act as the competent person on the job.

In addition, all employees working on the project must have taken an "Asbestos Abatement Worker" course.

E. SPECIAL REPORTS

1. Reporting Unusual Events

When an event of unusual and significant nature occurs at the site (e.g., a spill of asbestos debris, failure of special equipment used to contain asbestos), the ABATEMENT CONTRACTOR shall prepare and submit a special report listing the chain of events, persons participating, response by ABATEMENT CONTRACTOR's personnel, evaluation of results, and other pertinent information.

2. Reporting Accidents

The ABATEMENT CONTRACTOR shall prepare and submit reports of significant accidents at the subject site. Pertinent data and actions need to be recorded. In addition, response actions should comply with industry standards. For this purpose, a significant accident is defined to include events where personal injury or property loss of substance is sustained, or where the event posed a significant threat of loss or personal injury or potential environmental contamination.

F. COMPLIANCE WITH CODES AND REGULATIONS

1. Except to the extent that more explicit, or more stringent requirements are written directly into this Asbestos Abatement Contract/Specification, all applicable codes, regulations, and standards have the same force and effect (and are made a part of the contract documents by reference) as if copied directly into the contract documents, or as if published copies are bound herewith.

2. The ABATEMENT CONTRACTOR will assume full responsibility and liability for the compliance with all applicable federal/state/local regulations pertaining to work practices, protection of workers, and visitors to the site, persons occupying areas adjacent to the site, hauling, and disposal of waste. The ABATEMENT CONTRACTOR shall hold the City and its representative harmless for the ABATEMENT CONTRACTOR's failure to comply with any applicable work, hauling, disposal, safety, health, or other regulation on the part of itself, its employees, or its sub ABATEMENT CONTRACTORS.

3. State requirements which govern asbestos abatement activities or hauling and disposal of hazardous waste include, but are not limited to, the following:

- a) As required, ABATEMENT CONTRACTOR shall notify all Local, State, and Federal agencies regulating standards for the removal of asbestos-containing materials, including but not limited to: Cal-OSHA, San Diego Air

Pollution Control District, and U.S. Environmental Protection Agency. ABATEMENT CONTRACTOR shall provide Owner a copy of each notification and a copy of a certified mail receipt proving proper notification to all required agencies.

b) ABATEMENT CONTRACTOR shall be registered as an asbestos contractor before performing any asbestos related work; a licensee must also be registered with the Department of Industrial Relations, Division of Occupational Safety and Health.

c) Transportation of hazardous materials shall be in accordance with the State of California Title 22 and the Department of Transportation regulations.

d) ABATEMENT CONTRACTOR shall comply with all provisions of California Title 8, Section 5208 and Section 1529.

e) ABATEMENT CONTRACTOR shall be in compliance with all provisions of Title 40 CFR Part 61.

f) ABATEMENT CONTRACTOR shall assume full responsibility and liability for compliance with all applicable Federal, State, and local regulations pertaining to work practices, hauling, disposal, and protection of workers, visitors to site, and persons occupying areas adjacent to the site.

#### G. PERMITS AND LICENSES

The ABATEMENT CONTRACTOR shall submit to the City in the bid submittal any permits or licenses necessary to carry out this work.

##### 1. Permits

A valid Hazardous Waste Hauler registration is required for transporting any hazardous waste. Certain types of equipment require APCD permits (e.g., abrasive blasters).

##### 2. Licenses

The ABATEMENT CONTRACTOR must be certified by the California Contractors State License Board. The ABATEMENT CONTRACTOR, or its subcontractor, shall have current licenses, as required by all applicable state or local jurisdictions for the removal, transportation, disposal, or other regulated activity relative to the work described in this plan.

#### H. HEALTH AND SAFETY

This section describes the equipment and procedures required for protecting workers from asbestos contamination and other workplace hazards.

1. Provide worker protection as required by the most stringent OSHA and/or EPA standards applicable to the work.

##### 2. Training

a) All workers are to be trained, certified and accredited as required by state or local code or regulation.

b) Train all workers, in accordance with Title 8 CCR section 5208 and section 1529, regarding the dangers inherent in handling asbestos and breathing asbestos dust, proper work procedures, and personal and area protective measures.

c) Provide medical examinations for all workers who may encounter an airborne fiber level of 0.1 fibers/cc or greater for an 8 hour Time Weighted Average. In the absence of specific airborne fiber data, provide medical examinations for all workers who will enter the Work Area for any reason. Examination shall as a minimum meet requirements as set forth in Title 8 CCR 1529. In addition, provide an evaluation of the individual's ability to work in environments capable of producing heat stress in the worker.

3. Protective clothing

a) Coveralls: Provide disposable "full body" coveralls and disposable head covers, and require that they be worn at all times by all workers in the Work Area. Provide a sufficient number for all required changes, for all workers in the Work Area.

b) Boots: Provide work boots with non skid soles, and where required by OSHA, foot protection for all workers. Provide boots at no cost to workers. Do not allow boots to be removed from the Work Area for any reason, after being contaminated with asbestos-containing material. Thoroughly clean, decontaminate and bag boots before removing them from Work Area at the end of the work.

c) Hard Hats: Provide head protection (hard hats) as required by OSHA for all workers, and provide 1 spare for use by Owner's Representative, Project Administrator, and Owner. Require hard hats to be worn at all times that work is in progress that may potentially cause head injury. Provide hard hats of the type with plastic strap suspension. Require hats to remain in the Work Area throughout the work. Thoroughly clean, decontaminate and bag hats before removing them from Work Area at the end of the work.

d) Goggles: Provide eye protection (goggles) as required by OSHA for all workers involved in scraping, spraying, or any other activity which may potentially cause eye injury. Thoroughly clean, decontaminate and bag goggles before removing them from Work Area at the end of the work.

e) Gloves: Provide work gloves to all workers and require that they be worn at all times in the Work Area. Do not remove gloves from Work Area and dispose of as asbestos-contaminated waste at the end of the work.

4. Respirators

a) Air Purifying Respirators

(1) Respirator Bodies: Provide half face or full face type respirators based upon appropriate protection factor as determined by the ABATEMENT CONTRACTORS competent person. .

- (2) Filter Cartridges: Provide, at a minimum, HEPA type filters labeled with NIOSH and MSHA Certification for "Radionuclides, Radon Daughters, Dust, Fumes, Mists including Asbestos Containing Dusts and Mists" and color coded in accordance with ANSI Z228.2 (1980). In addition, a chemical cartridge section may be added, if required, for solvents, etc., in use. In this case, provide cartridges that have each section of the combination canister labeled with the appropriate color code and NIOSH/MSHA Certification.
  - (3) Non permitted respirators: Do not use single use, disposable or quarter face respirators.
  - (4) Require that respiratory protection be used at all times when there is any possibility of disturbance of asbestos containing materials whether intentional or accidental.
  - (5) Require that a respirator be worn by anyone in a Work Area at all times, regardless of activity, during a period that starts with any operation which could cause airborne fibers until the area has been cleared for re occupancy.
  - (6) Regardless of Airborne Fiber Levels: Require that the minimum level of respiratory protection used be half face air purifying respirators with high efficiency filters.
- b) Fit testing
- (1) Initial Fitting: Provide initial fitting of respiratory protection during a respiratory protection course of training. Only allow an individual to use respirators for which training and fit testing has been provided.
  - (2) Upon Each Wearing: Require that each time an air purifying respirator is put on it be checked for fit with a positive and negative pressure fit check in accordance with the manufacturer's instructions or ANSI Z88.2 (1980).
- c) Respirators, disposable coveralls, head covers, and foot covers shall be provided by the ABATEMENT CONTRACTOR for the City of San Diego's Asbestos and Lead Management Program's PROJECT MONITOR, and other authorized representatives who may inspect the job site. Provide two (2) respirators and six (6) complete coveralls and, where applicable, six (6) respirator filter changes per day.
5. Materials and Equipment
- a) Only material and equipment that are recognized as being suitable for the intended use, by compliance with appropriate standards, may be used.
6. Water Service

a) The ABATEMENT CONTRACTOR will be able to obtain water services from on-site facilities. The City will designate the facilities from which water service may be obtained.

7. Electrical Services

a) The ABATEMENT CONTRACTOR will be able to obtain electrical services from on-site facilities. The City will designate the facilities from which electrical services may be obtained. The ABATEMENT CONTRACTOR shall provide their own electrical hook-ups, i.e. spider boxes, ground fault circuit interrupter (GFCI) etc. and installed by a licensed electrician.

b) The electrical services need to comply with the applicable NEMA, NECA, and UL standards, and governing regulations for materials and lay-out of temporary electrical services.

8. Sanitary Facilities

a) The ABATEMENT CONTRACTOR shall provide sanitary facilities on site, if none have been made available by the City.

9. Fire Extinguisher

a) Applicable recommendations of the National Fire Protection Association (NFPA) Standard 10, "Standard for Portable Fire Extinguishers," must be complied with by the ABATEMENT CONTRACTOR. Fire extinguishers need to be located where they are most convenient and effective for their intended purpose, but not less than one (1) extinguisher in each work area, the equipment room, outside/work areas, and in the clean room.

10. First Aid

a) The ABATEMENT CONTRACTOR will need to provide first aid supplies which should comply with the governing regulations and recognized recommendations within the construction industry.

I. WORK AREA PROCEDURES

1. Require that workers NOT eat, drink, smoke, chew tobacco or gum, or apply cosmetics in the Work Area.

2. ABATEMENT CONTRACTOR shall secure work area from access by public, staff or users of the area. Accomplish this where possible, by locking doors, gates, or other means of access to the area.

3. Barricade fencing is required for securing an outside area from unauthorized access. Work area delineation shall occur at no less than twelve feet (12') from the radius of the work and/or building. Yellow caution tape shall not be used.

4. All windows, vents, mechanical systems, etc., in close proximity to the abatement area shall be sealed with plastic and tape by the ABATEMENT CONTRACTOR prior to the work beginning.

5. Provide warning signs at entry to work area in accordance with California Title 8, Section 1529.

6. A visitor entry and exit-log, and an employee daily sign-in log shall be maintained throughout the asbestos abatement activities. The ABATEMENT CONTRACTOR shall be responsible for the project site security during the operations in order to protect work efforts and equipment.

J. REMOVAL OF ASBESTOS-CONTAINING MATERIALS

1. Asbestos-containing materials shall be adequately wetted with either amended water or a removal encapsulant before and during removal process, to reduce fiber emission.

2. The ABATEMENT CONTRACTOR should exercise caution in using water, as he will be solely responsible for any water damage to the facility resulting from the work.

3. ABATEMENT CONTRACTOR is responsible for keeping all asbestos containing debris within the containment area at all times throughout removal. Any interior contamination, if created, is the responsibility of the ABATEMENT CONTRACTOR to clean at no additional cost to the City.

4. ABATEMENT CONTRACTOR shall ensure there is no loose debris around the Work Area during the removal and if found, ABATEMENT CONTRACTOR shall clean the area immediately.

K. DISPOSAL

1. Both non-friable and friable ACM shall be containerized immediately, secured in a locked container, be transported by state licensed hauler with manifest, and disposed of at appropriate landfill location.

2. The PROJECT MONITOR or designated representative will inspect each load and sign all waste manifests before waste leaves the site.

3. Copies of Waste Shipment Records for each load of asbestos waste material shall be given to the City.

4. Cordon off the Work Area, a safe zone around the building, and the dumpster area with barrier fencing. Yellow caution tape shall not be used.

5. Provide warning signs at Work Area access in accordance with Title 8 CCR 1529

L. DECONTAMINATION PROCEDURE

1. Prior to leaving the Work Area, HEPA vacuum outer suit completely and remove, turning it inside out while doing so.

2. Hygiene facilities such as change rooms and showers are not required to be adjacent to the operations on top of Work Areas on top of a roof, but these facilities must be provided [Title 8, Section 1529 (1)(3)]. Proceed to decontamination area where the second suit is to be removed while turning it inside out.

3. After wiping all areas and respirator, remove respirator and wipe facial area clean.

4. Place contaminated suits, towels, and respirator cartridges in a properly labeled asbestos waste bag.
5. At the completion of the project, boots, hard hats, and goggles should be decontaminated and bagged prior to removal from the Work Area.
6. Equipment leaving the Work Area should be HEPA vacuumed and wet wiped.

M. AIR MONITORING/WORK AREA CLEARANCE

1. The City's PROJECT MONITOR will provide ambient area air monitoring during all phases of the removal of asbestos-containing materials, including the interior and/or exterior of the facility.
2. During the project, personal air monitoring will be conducted by ABATEMENT CONTRACTOR to determine fiber levels. If fiber levels exceed 0.05 fibers/cc then work shall cease and not begin again until after PROJECT MONITOR approves the ABATEMENT CONTRACTOR's revised methodology which will lower fiber levels. Procedures shall be submitted in writing to the City prior to implementing these procedures. At a minimum, ABATEMENT CONTRACTOR shall provide air monitoring for every four workers. Testing of air samples will be by Phase Contrast Microscopy following NIOSH 7400 rules.
3. If any of the ambient area samples taken by the PROJECT MONITOR either inside or outside exceed .01 fibers/cc then ABATEMENT CONTRACTOR is required to pay for the additional testing on those samples collected using transmission electron microscopy (TEM).
4. Release of the ABATEMENT CONTRACTOR from the asbestos-containing material removal phase of the contract will be determined by the PROJECT MONITOR based upon the results of visual inspection and/or clearance air sampling.

N. TRANSPORTATION AND DISPOSAL

1. Any packaging used to ship hazardous waste off site such as a container, roll-off bin, tank or other device, must comply with 49 CFR Parts 173, 178, 179 and be labeled and prepared for transportation in accordance with Title 22 CCR Article 3. The hazardous waste label must be affixed and filled out when the first amount of hazardous waste is placed in the container. The label must include the initial accumulation date.
2. All additional pre-transportation labeling, marking or placarding must be conducted prior to transporting off site and in accordance with Title 22 CCR Chapter 12, Article 3.
3. All containers and tanks of hazardous waste must be managed in a way which minimizes the threat of fire, explosion, or any unplanned sudden or non-sudden release of hazardous waste to the air, soil or surface water which could threaten human health or the environment. Management techniques include containment areas capable of holding the contents of largest container within the containment area. Properly store and secure waste at all times. Do not leave hazardous waste in uncovered or unlocked trucks or dumpsters.



4. A hazardous waste manifest will be completed in accordance with Title 22 CCR Chapter 12, Article 2 for each shipment of hazardous waste leaving the work site. All waste shall leave the project site by the end of the project. Only The PROJECT MONITOR shall sign as the generator on manifests

# APPENDIX A

## CERTIFICATE OF WORKER'S ACKNOWLEDGMENT

PROJECT NAME: \_\_\_\_\_ DATE: \_\_\_\_\_

PROJECT ADDRESS: \_\_\_\_\_

CONTRACTOR'S NAME: \_\_\_\_\_

Working with asbestos can be dangerous. Inhaling asbestos fibers has been linked with various types of cancer. If you smoke and inhale asbestos fibers the chance that you will develop lung cancer is greater than that of the non-smoking public.

Your employer's contract with the City for the above project requires that: You be supplied with the proper respirator and be trained in its use. You be trained in safe work practices and in the use of the equipment found on the job. You receive a medical examination. These things are to have been done at no cost to you.

**RESPIRATORY PROTECTION:** You must have been trained in the proper use of respirators, and informed of the type respirator to be used on the above referenced project. You must be given a copy of the written respiratory protection manual issued by your employer. You must be equipped at no cost with the respirator to be used on the above project.

**TRAINING COURSE:** You must have been trained in the dangers inherent in handling asbestos and breathing asbestos dust and in proper work procedures and personal and area protective measures. The topics covered in the course must have included the following:

- Physical characteristics of asbestos
- Health hazards associated with asbestos
- Respiratory protection
- Use of protective equipment
- Pressure Differential Systems
- Work practices including hands on or on job training
- Personal decontamination procedures
- Air monitoring, personal and area

**MEDICAL EXAMINATION:** You must have had a medical examination within the past 12 months at no cost to you. This examination must have included: health history, pulmonary function tests and may have included an evaluation of a chest x ray.

By signing this document you are acknowledging only that the City has advised you of your rights to training and protection relative to your employer, the ABATEMENT CONTRACTOR.

Signature: \_\_\_\_\_ Social Security No.: \_\_\_\_\_

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

Witness (print): \_\_\_\_\_ Witness Signature: \_\_\_\_\_

APPENDIX B

CERTIFICATION OF VISUAL INSPECTION

Project # \_\_\_\_\_ Date: \_\_\_\_\_ Location: \_\_\_\_\_

Contractor: \_\_\_\_\_

The contractor hereby certifies that he/she has visually inspected the Work Area (all surfaces including pipes, counters, ledges, walls, ceiling and floor, behind critical barriers, sheet plastic, etc.) and has found no dust, debris or residue.

by: (Signature): \_\_\_\_\_ Date: \_\_\_\_\_

(Print Name): \_\_\_\_\_

(Company Name): \_\_\_\_\_

(Print Title): \_\_\_\_\_

CITY ALMP REPRESENTATIVE

The City ALMP Representative hereby certifies that he has accompanied the contractor on his/her visual inspection and verifies that this inspection has been thorough and to the best of his/her knowledge and belief, the contractor's certification above is a true and honest one.

by: (Signature): \_\_\_\_\_ Date: \_\_\_\_\_

(Print Name): \_\_\_\_\_

WORK AREA

Location: \_\_\_\_\_

Room: \_\_\_\_\_

Hazard Reduction Performed:

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

## APPENDIX C

### SUMMARY OF ASBESTOS RESULTS / LAB DATA

<b>STATION</b>	<b>SAMPLE</b>	<b>LOCATION</b>	<b>MATERIAL</b>	<b>ASBESTOS %</b>
<b>3</b>	<b>6483-1</b>	<b>Bathroom 1</b>	<b>Orange Vinyl Sheet Flooring</b>	<b>45%</b>
3	6483-2A	Kitchen	Tan Vinyl Sheet Flooring	ND
3	6483-2B	Kitchen	Tan Vinyl Sheet Flooring	ND
3	6483-2B M	Kitchen	Associated Mastic	ND
<b>3</b>	<b>6483-3</b>	<b>Kitchen Storage</b>	<b>Orange Vinyl Sheet Flooring</b>	<b>40%</b>
<b>3</b>	<b>6483-3 M</b>	<b>Kitchen Storage</b>	<b>Associated Mastic</b>	<b>&lt;1%</b>
3	6483-4A	Bathroom 2	Tan Vinyl Sheet Flooring	ND
3	6483-4A M	Bathroom 2	Associated Mastic	ND
3	6483-4B	Bathroom 2	Tan Vinyl Sheet Flooring	ND
3	6483-4B M	Bathroom 2	Associated Mastic	ND
<b>3</b>	<b>6483-5</b>	<b>Bathroom 3</b>	<b>Orange Vinyl Sheet Flooring</b>	<b>45%</b>
3	7107-3B-001	Apparatus Bay	Drywall Composite	ND
3	7107-3B-002	Apparatus Bay	Drywall Composite	ND
3	7107-3B2-003	Reception	Acoustical Ceiling Spray	ND
3	7107-3B-004	1 <sup>st</sup> Floor Hallway	Acoustical Ceiling Spray	ND
3	7107-3B-005	Kitchen	Acoustical Ceiling Spray	ND
3	7107-3B-006	1 <sup>st</sup> Floor Hallway	Carpet Mastic	ND
3	7107-3B-007	Kitchen	Linoleum Backing	ND
3	7107-3B-008	Kitchen/Bullpen	Acoustical Ceiling Spray	ND
3	7107-3B-009	Kitchen/Bullpen	Acoustical Ceiling Spray	ND
3	7107-3B-010	Kitchen	Drywall Composite	ND
3	7107-3B-011	Bedroom 2	Drywall Composite	ND
3	7107-3B-012	Bedroom 1	Drywall Composite	ND
3	7107-3B-013	Bedroom 1	Drywall Composite	ND
3	7107-3B-014	2 <sup>nd</sup> Floor Hallway	Acoustical Ceiling Spray	ND
3	7107-3B-015	Bedroom 1	Acoustical Ceiling Spray	ND
3	7107-3B-016	Bedroom 1	Acoustical Ceiling Spray	ND


<b>STATION</b>	<b>SAMPLE</b>	<b>LOCATION</b>	<b>MATERIAL</b>	<b>ASBESTOS %</b>
3	7107-3B-017	Bedroom 1	Drywall Composite	ND
3	7107-3B-018	Kitchen	Drywall Composite	ND
8	7106-B-001	Hallway	Drywall Composite Ceiling	ND
8	7106-B-002	Hallway	Drywall Composite Ceiling	ND
8	7106-B-003	Laundry Room	Plaster Ceiling	ND
8	7106-B-004	Launder Room	Plaster Ceiling	ND
8	7106-B-005	Utility Room	Plaster Ceiling	ND
8	7106-B-006	Utility Room	Plaster Ceiling	ND
8	7106-B-007	Utility Room	Plaster Wall	ND
8	7106-B-008	Utility Room	Plaster Wall	ND
8	7106-B-009	Kitchen	Ceiling Tile Mastic	ND
8	7106-B-010	Kitchen	Drywall Composite Ceiling	ND
<b>8</b>	<b>7106-B-011</b>	<b>Bull Pen</b>	<b>Carpet Mastic</b>	<b>2%</b>
8	7106-B-012	Bull Pen	Base Cove Mastic	ND
15	6953-001	Dorm 1	Plaster Ceiling	ND
15	6953-002	Hallway	Plaster Ceiling	ND
15	6953-003	Hallway	Drywall Composite Ceiling	ND
15	6953-004	Break Room	Drywall Composite Ceiling	ND
<b>15</b>	<b>7105-B-001</b>	<b>Bull Pen</b>	<b>9"x9" Vinyl Flooring W/Mastic, Under Carpeting</b>	<b>4% - Tile 5% - Mastic</b>
<b>15</b>	<b>7105-B-002</b>	<b>Bull Pen</b>	<b>9"x9" Vinyl Flooring W/Mastic, Under Carpeting</b>	<b>4% - Tile 5% - Mastic</b>
<b>15</b>	<b>7105-B-003</b>	<b>Kitchen</b>	<b>9"x9" Vinyl Flooring w/Mastic, Under Carpeting</b>	<b>4% - Tile 5% - Mastic</b>
15	7105-B-004	Kitchen	Gray Base Cove w/Mastic	ND
15	7105-B-005	Kitchen	Black Base Cove w/Mastic	ND
15	7105-B-006	Kitchen	Plaster Wall	ND
15	7105-B-007	Bull Pen	Plaster Wall	ND
15	7105-B-008	Exterior East Site	Stucco	ND
15	7105-B-009	Exterior North Side	Stucco	ND

\*No Asbestos Detected

**Report No:** 139091 **Customer:** City of San Diego  
**Date:** July 21, 2010 **Address:** 9601 Ridgehaven Ct. #320  
**Date Received:** July 16, 2010 **City:** San Diego, CA 92123  
**Date Analyzed:** July 21, 2010 **Attention:** Jeff Jones  
**Date/Time Collected:** by Jeff Jones **Reference:** PO#1078974; Project#6483  
**Subject:** Polarized Light Microscopy Analysis for Asbestos 11 Samples  
**Methodology:** "Method for Determination of Asbestos in Bulk Building Materials." EPA 600/R-93/116  
**Accredited:** NVLAP Lab Code 101218-0  
**Certified:** California Department of Health Services Environmental Testing Laboratory ELAP 1119  
 County Sanitation Districts of Los Angeles County, Lab ID No. 10120

Quality Control Sample (SRM 1866 Glass Fibers as the blank): None Detected

Sample ID	Location / Description	Visual Description	Asbestiform Minerals	Other Fibrous Materials	Non-fibrous Materials
6483-1	NON-FRIABLE	GRAY FIBROUS	CHRYBOTILE 45%	NONE DETECTED	GRANULAR MINERALS, OPAQUES
6483-2A	NON-FRIABLE	GRAY FIBROUS	NONE DETECTED	FIBERGLASS 5%; SYNTHETICS 5%	GRANULAR MINERALS, OPAQUES, DIATOM
6483-2B	NON-FRIABLE	GRAY FIBROUS	NONE DETECTED	FIBERGLASS 5%; SYNTHETICS 5%	GRANULAR MINERALS, OPAQUES, DIATOM
6483-2B M	NON-FRIABLE	TAN SOLID	NONE DETECTED	NONE DETECTED	GRANULAR MINERALS, OPAQUES, RESIN
6483-3	NON-FRIABLE	GRAY FIBROUS	CHRYBOTILE 40%	CELLULOSE 5%	GRANULAR MINERALS, OPAQUES
6483-3 M	NON-FRIABLE	TAN SOLID	CHRYBOTILE - LESS THAN 1%	CELLULOSE 1%	GRANULAR MINERALS, OPAQUES, RESIN
6483-4A	NON-FRIABLE	GRAY FIBROUS	NONE DETECTED	CELLULOSE 30%; FIBERGLASS 1%	GRANULAR MINERALS, OPAQUES
6483-4A M	NON-FRIABLE	BROWN STICKY	NONE DETECTED	CELLULOSE - LESS THAN 1%	GRANULAR MINERALS, OPAQUES, RESIN
6483-4B	NON-FRIABLE	GRAY FIBROUS	NONE DETECTED	CELLULOSE 40%	GRANULAR MINERALS, OPAQUES
6483-4B M	NON-FRIABLE	BROWN STICKY	NONE DETECTED	CELLULOSE - LESS THAN 1%	GRANULAR MINERALS, OPAQUES, RESIN
6483-5	NON-FRIABLE	GRAY FIBROUS	CHRYBOTILE 45%	NONE DETECTED	GRANULAR MINERALS, OPAQUES

  
 Jeff Wan, Optical Microscopist  
 BMK/mt

B.M. Kolk, Laboratory Director

The EPA method is a semi-quantitative procedure. The detection limit is between 0.1 - 1% by area and is dependent upon the size of the asbestos fibers, the means of sampling and the matrix of the sampled material.

The test results reported are for the sample(s) delivered to us and may not represent the entire material from which the samples was taken. The EPA recommends three samples or more be taken from a "homogenous sampling area" before friable material is considered non-asbestos-containing.

\*\* Negative floor tile samples may contain significant amounts (>1%) of very thin asbestos fibers which cannot be detected by PLM. Confirmation by XRD or TEM is recommended by the EPA (Federal Register Vol. 59, No. 146).

This report, from a NIST-accredited laboratory through NVLAP, must not be used by the client to claim product endorsement by NVLAP or any agency of the U.S. government. This report shall not be reproduced, except in full, without the written approval of EMS Laboratories.

Samples were received in good condition unless otherwise noted.



**H.M. Pitt Labs, Inc.**  
 4901 Morena Blvd · Ste 203 · San Diego, CA 92117

**Lab Number: 153646-206390**  
 Tel: 619-474-8548 · Fax: 858-412-3305

**Company:**  
 City of San Diego Environmental Services  
 Department  
 9601 Ridgehaven Court, Suite 310  
 San Diego, CA 92123

**Date Entered:** 11/28/2016  
**Analyzed By:** Michelle Lavallee

**Date Analyzed:** 11/29/16  
**Customer PO / Claim#:**  
**Contract Number:**

**Job Site:** Project #7107

**Date Sampled**      **Who Sampled**  
 11/22/2016      Jessica Weislogel

**Lab Notes:** 48 HR TAT

**POLARIZED LIGHT MICROSCOPY ANALYSIS REPORT - EPA-600/R-93/116 AND EPA-600/M4-82-020**

**Analysis Number:** 153646-1  
**Customer Number:** 3B-001  
**Classification:**      **Description:** Bulk Sample 1  
**Results:** Non-Asbestos: Non-Fibrous White Joint Compound

**Analysis Number:** 153646-2  
**Customer Number:** 3B-002  
**Classification:**      **Description:** Bulk Sample 2  
**Results:** Non-Asbestos: 1% Cellulose Fibers in Tan Drywall

**Analysis Number:** 153646-3  
**Customer Number:** 3B-003  
**Classification:**      **Description:** Bulk Sample 3  
**Results:** Non-Asbestos: Non-Fibrous White Acoustic Ceiling

**Analysis Number:** 153646-4  
**Customer Number:** 3B-004  
**Classification:**      **Description:** Bulk Sample 4  
**Results:** Non-Asbestos: Non-Fibrous White Acoustic Ceiling

- All samples tested as submitted to the lab. H.M. PITT LABS, INC. does not assume responsibility for the accuracy of the information submitted with the samples unless done by an employee of H.M. PITT LABS, INC.
- These test results relate only to the sample(s) identified above.
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- Samples are archived for 2 years from date of receipt and will be disposed of properly following this period.
- Quantitative value is based on PLM CVES (Calibrated Visual Estimates) with a detection limit of <1%.

**APPROVED BY:**   
 LELAND S. PITT, CH

**Dated:** 11/28/2016

**REVIEWED BY:**   
 Michelle Lavallee



**H.M. Pitt Labs, Inc.**  
4901 Morena Blvd · Ste 203 · San Diego, CA 92117

**Lab Number: 153646-206390**  
Tel: 619-474-8548 · Fax: 858-412-3305

**Company:**  
City of San Diego Environmental Services  
Department  
9601 Ridgehaven Court, Suite 310  
San Diego, CA 92123

**Date Entered:** 11/28/2016  
**Analyzed By:** Michelle Lavallee

**Date Analyzed:** 11/29/16  
**Customer PO / Claim#:**  
**Contract Number:**

**Job Site:** Project #7107

**Date Sampled**      **Who Sampled**  
11/22/2016      Jessica Weislogel

**Lab Notes:** 48 HR TAT

**POLARIZED LIGHT MICROSCOPY ANALYSIS REPORT - EPA-600/R-93/116 AND EPA-600/M4-82-020**

**Analysis Number:** 153646-5

**Customer Number:** 3B-005

**Classification:**

**Description:** Bulk Sample 5

**Results:** Non-Asbestos: Non-Fibrous White Acoustic Ceiling

**Analysis Number:** 153646-6

**Customer Number:** 3B-006

**Classification:**

**Description:** Bulk Sample 6

**Results:** Non-Asbestos: Non-Fibrous Tan Mastic

**Analysis Number:** 153646-7

**Customer Number:** 3B-007

**Classification:**

**Description:** Bulk Sample 7

**Results:** A: Non-Asbestos: 25% Cellulose Fibers in Tan Sheet Vinyl  
B: Non-Asbestos: Non-Fibrous Tan Mastic

**Analysis Number:** 153646-8

**Customer Number:** 3B-008

**Classification:**

**Description:** Bulk Sample 8

**Results:** Non-Asbestos: Non-Fibrous White Acoustic Ceiling

- All samples tested as submitted to the lab. H.M. PITT LABS, INC. does not assume responsibility for the accuracy of the information submitted with the samples unless done by an employee of H.M. PITT LABS, INC.
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- Samples are archived for 2 years from date of receipt and will be disposed of properly following this period.
- Quantitative value is based on PLM CVES (Calibrated Visual Estimates) with a detection limit of <1%.

**APPROVED BY:**

*Leland S. Pitt*

LELAND S. PITT, CIH

**Dated:** 11/28/2016

**REVIEWED BY:**

*Michelle Lavallee*

Michelle Lavallee

Page 2 of 5







# H.M. Pitt Labs, Inc.

4901 Morena Blvd · Ste 203 · San Diego, CA 92117

# Lab Number: 153646-206390

Tel: 619-474-8548 · Fax: 858-412-3305

**Company:**

City of San Diego Environmental Services  
Department  
9601 Ridgehaven Court, Suite 310  
San Diego, CA 92123

**Date Entered:** 11/28/2016  
**Analyzed By:** Michelle Lavallee

**Date Analyzed:** 11/29/16  
**Customer PO / Claim#:**  
**Contract Number:**

**Job Site:** Project #7107

**Date Sampled**     **Who Sampled**  
11/22/2016     Jessica Weislogel

**Lab Notes:** 48 HR TAT

## POLARIZED LIGHT MICROSCOPY ANALYSIS REPORT - EPA-600/R-93/116 AND EPA-600/M4-82-020

**Analysis Number:** 153646-13

**Customer Number:** 3B-013

**Classification:**

**Description:** Bulk Sample 13

**Results:** Non-Asbestos: 1% Cellulose Fibers in White Drywall

**Analysis Number:** 153646-14

**Customer Number:** 3B-014

**Classification:**

**Description:** Bulk Sample 14

**Results:** Non-Asbestos: Non-Fibrous White Acoustic Ceiling

**Analysis Number:** 153646-15

**Customer Number:** 3B-015

**Classification:**

**Description:** Bulk Sample 15

**Results:** Non-Asbestos: Non-Fibrous White Acoustic Ceiling

**Analysis Number:** 153646-16

**Customer Number:** 3B-016

**Classification:**

**Description:** Bulk Sample 16

**Results:** Non-Asbestos: Non-Fibrous White Acoustic Ceiling

- All samples tested as submitted to the lab. H.M. PITT LABS, INC. does not assume responsibility for the accuracy of the information submitted with the samples unless done by an employee of H.M. PITT LABS, INC.
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- Samples are archived for 2 years from date of receipt and will be disposed of properly following this period.
- Quantitative value is based on PLM CVES (Calibrated Visual Estimates) with a detection limit of <1%.

**APPROVED BY:**

LELAND S. PITT, CIH

**Dated:** 11/29/2016

**REVIEWED BY:**

Michelle Lavallee

Page 4 of 5



**H.M. Pitt Labs, Inc.**  
4901 Morena Blvd · Ste 203 · San Diego, CA 92117

**Lab Number: 153646-206390**  
Tel: 619-474-8548 · Fax: 858-412-3305

**Company:**  
City of San Diego Environmental Services  
Department  
9601 Ridgehaven Court, Suite 310  
San Diego, CA 92123

**Date Entered:** 11/28/2016  
**Analyzed By:** Michelle Lavallee

**Date Analyzed:** 11/29/16  
**Customer PO / Claim#:**  
**Contract Number:**

**Job Site:** Project #7107

**Date Sampled**      **Who Sampled**  
11/22/2016      Jessica Weislogel

**Lab Notes:** 48 HR TAT

**POLARIZED LIGHT MICROSCOPY ANALYSIS REPORT - EPA-600/R-93/116 AND EPA-600/M4-82-020**

**Analysis Number:** 153646-17

**Customer Number:** 3B-017

**Classification:**

**Description:** Bulk Sample 17

**Results:** Non-Asbestos: Non-Fibrous White Joint Compound

**Analysis Number:** 153646-18

**Customer Number:** 3B-018

**Classification:**

**Description:** Bulk Sample 18

**Results:** Non-Asbestos: 1% Cellulose Fibers in White Drywall

- All samples tested as submitted to the lab. H.M. PITT LABS, INC. does not assume responsibility for the accuracy of the information submitted with the samples unless done by an employee of H.M. PITT LABS, INC.
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- Quantitative value is based on PLM CVES (Calibrated Visual Estimates) with a detection limit of <1%.

**APPROVED BY:**   
LELAND S. PITT, CIH

**Dated:** 11/28/2016

**REVIEWED BY:**   
Michelle Lavallee



**CITY OF SAN DIEGO**  
**Environmental Services Department**  
**ALMP/LSHP - Laboratory Submittal**



LAB # 153646

Project # 7107 Submitted by: Jessica Weislogel Date: 11/22/2016 Page 1 of 2

LAB SUBMITTED TO: H.M. Pitt

TURNAROUND TIME:  2 HOUR  24 HOUR  48 HOUR  72 HOUR  5 DAY  OTHER:

**The receiving Laboratory is required to complete the following:**

- All Invoices are to be sent to: Attn. Alan Johannis- City of San Diego - Environmental Services Department, 9601 Ridgehaven Court, Suite 370 San Diego, CA 92123
- Lab reports/invoices are to contain the Project Number listed above. Do not include Purchase Order Numbers on Invoices
- Email report to: [JWeislogel@sandiego.gov](mailto:JWeislogel@sandiego.gov)

Lab Number	Sample No.	Location	Media	Time On/Off	Flow	Volume	Analyses Requested
	3B-001	Bulk Sample 1	Bulk	/			PLM
	3B-002	Bulk Sample 2	Bulk	/			PLM
	3B-003	Bulk Sample 3	Bulk	/			PLM
	3B-004	Bulk Sample 4	Bulk	/			PLM
	3B-005	Bulk Sample 5	Bulk	/			PLM
	3B-006	Bulk Sample 6	Bulk	/			PLM
	3B-007	Bulk Sample 7	Bulk	/			PLM
	3B-008	Bulk Sample 8	Bulk	/			PLM
	3B-009	Bulk Sample 9	Bulk	/			PLM
	3B-010	Bulk Sample 10	Bulk	/			PLM

NOTES:

Relinquished by: Jessica Weislogel Date/Time: 11/28/2016 15:46

Relinquished by: *[Signature]* Date/Time: 11/28/16 13:30



CITY OF SAN DIEGO  
Environmental Services Department  
ALMP/LSHHP - Laboratory Submittal



LAB # 153646

Project # 7107 Submitted by: Jessica Weislogel Date: 11/22/2016 Page 2 of 2

LAB SUBMITTED TO: H.M. Pitt

TURNAROUND TIME:  
 2 HOUR  24 HOUR  48 HOUR  72 HOUR  5 DAY  OTHER:

The receiving Laboratory is required to complete the following:

- All Invoices are to be sent to: *Attn. Alan Johanns- City of San Diego - Environmental Services Department, 9601 Ridgehaven Court, Suite 310 San Diego, CA 92123*
- Lab reports/invoices are to contain the Project Number listed above. Do not include Purchase Order Numbers on Invoices
- Email report to: *JWeisloge@sandiego.gov*

Lab Number	Sample No.	Location	Media	Time On/Off	Flow	Volume	Analyses Requested
	3B-011	Bulk Sample 11	Bulk	/			PLM
	3B-012	Bulk Sample 12	Bulk	/			PLM
	3B-013	Bulk Sample 13	Bulk	/			PLM
	3B-014	Bulk Sample 14	Bulk	/			PLM
	3B-015	Bulk Sample 15	Bulk	/			PLM
	3B-016	Bulk Sample 16	Bulk	/			PLM
	3B-017	Bulk Sample 17	Bulk	/			PLM
	3B-018	Bulk Sample 18	Bulk	/			PLM

NOTES:

Relinquished by: *Jessica Weislogel*  
 Date/Time: 11/28/2016 15:10

Received by: *K. Pitt*  
 Date/Time: 11/28/16 13:30



**H.M. Pitt Labs, Inc.**  
4901 Morena Blvd · Ste 203 · San Diego, CA 92117

**Lab Number: 153615-206323**  
Tel: 619-474-8548 · Fax: 858-412-3305

**Company:**  
City of San Diego Environmental Services  
Department  
9601 Ridgehaven Court, Suite 310  
San Diego, CA 92123

**Date Entered:** 11/23/2016  
**Analyzed By:** Michelle Lavallee  
**Date Analyzed:** 11/23/16  
**Customer PO / Claim#:**  
**Contract Number:**

**Job Site:** Project #7106

**Date Sampled**     **Who Sampled**  
11/21/2016     Jessica Weislogel

**Lab Notes:** 72 HR TAT

**POLARIZED LIGHT MICROSCOPY ANALYSIS REPORT - EPA-600/R-93/116 AND EPA-600/M4-82-020**

**Analysis Number:** 153615-1

**Customer Number:** B-001

**Classification:**

**Description:** Bulk Sample 1

**Results:** Non-Asbestos: Non-Fibrous White Joint Compound

**Analysis Number:** 153615-2

**Customer Number:** B-002

**Classification:**

**Description:** Bulk Sample 2

**Results:** A: Non-Asbestos: 1% Cellulose Fibers in White Drywall  
B: Non-Asbestos: 90% Cellulose Fibers in Brown Paper

**Analysis Number:** 153615-3

**Customer Number:** B-003

**Classification:**

**Description:** Bulk Sample 3

**Results:** A: Non-Asbestos: Non-Fibrous White Color Coat  
B: Non-Asbestos: Non-Fibrous Gray Plaster

**Analysis Number:** 153615-4

**Customer Number:** B-004

**Classification:**

**Description:** Bulk Sample 4

**Results:** A: Non-Asbestos: Non-Fibrous White Color Coat  
B: Non-Asbestos: Non-Fibrous Gray Plaster

- All samples tested as submitted to the lab. H.M. PITT LABS, INC. does not assume responsibility for the accuracy of the information submitted with the samples unless done by an employee of H.M. PITT LABS, INC.
- These test results relate only to the sample(s) identified above.
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- Samples are archived for 2 years from date of receipt and will be disposed of properly following this period.
- Quantitative value is based on PLM CVES (Calibrated Visual Estimates) with a detection limit of <1%.

**APPROVED BY:**

*Leland S. Pitt*

LELAND S. PITT, CIH

**Dated:** 11/28/2016

**REVIEWED BY:**

*Michelle Lavallee*

Michelle Lavallee

Page 1 of 3





# H.M. Pitt Labs, Inc.

4901 Morena Blvd · Ste 203 · San Diego, CA 92117

# Lab Number: 153615-206323

Tel: 619-474-8548 · Fax: 858-412-3305

**Company:**

City of San Diego Environmental Services  
Department  
9601 Ridgehaven Court, Suite 310  
San Diego, CA 92123

**Date Entered:** 11/23/2016**Analyzed By:** Michelle Lavallee**Date Analyzed:** 11/23/16**Customer PO / Claim#:****Contract Number:****Job Site:** Project #7106**Date Sampled****Who Sampled**

11/21/2016

Jessica Weislogel

**Lab Notes:** 72 HR TAT

## POLARIZED LIGHT MICROSCOPY ANALYSIS REPORT - EPA-600/R-93/116 AND EPA-600/M4-82-020

**Analysis Number:** 153615-5**Customer Number:** B-005**Classification:****Description:** Bulk Sample 5**Results:**  
A: Non-Asbestos: Non-Fibrous White Color Coat  
B: Non-Asbestos: Non-Fibrous Gray Plaster**Analysis Number:** 153615-6**Customer Number:** B-006**Classification:****Description:** Bulk Sample 6**Results:**  
A: Non-Asbestos: Non-Fibrous White Color Coat  
B: Non-Asbestos: Non-Fibrous Gray Plaster**Analysis Number:** 153615-7**Customer Number:** B-007**Classification:****Description:** Bulk Sample 7**Results:**  
A: Non-Asbestos: Non-Fibrous White Color Coat  
B: Non-Asbestos: Non-Fibrous Gray Plaster**Analysis Number:** 153615-8**Customer Number:** B-008**Classification:****Description:** Bulk Sample 8**Results:**  
A: Non-Asbestos: Non-Fibrous White Color Coat  
B: Non-Asbestos: Non-Fibrous Gray Plaster

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- Quantitative value is based on PLM CVES (Calibrated Visual Estimates) with a detection limit of <1%.

**APPROVED BY:**

LELAND S. PITT, CIH

**Dated:** 11/28/2016**REVIEWED BY:**

Michelle Lavallee

Page 2 of 3



**H.M. Pitt Labs, Inc.**  
4901 Morena Blvd · Ste 203 · San Diego, CA 92117

**Lab Number: 153615-206323**  
Tel: 619-474-8548 · Fax: 858-412-3305

**Company:**  
City of San Diego Environmental Services  
Department  
9601 Ridgehaven Court, Suite 310  
San Diego, CA 92123

**Date Entered:** 11/23/2016  
**Analyzed By:** Michelle Lavallee  
**Date Analyzed:** 11/23/16  
**Customer PO / Claim#:**  
**Contract Number:**

**Job Site:** Project #7106

**Date Sampled**    **Who Sampled**  
11/21/2016        Jessica Weislogel

**Lab Notes:** 72 HR TAT

**POLARIZED LIGHT MICROSCOPY ANALYSIS REPORT - EPA-600/R-93/116 AND EPA-600/M4-82-020**

**Analysis Number:** 153615-9

**Customer Number:** B-009

**Classification:**

**Description:** Bulk Sample 9

**Results:** Non-Asbestos: Non-Fibrous Tan Mastic

**Analysis Number:** 153615-10

**Customer Number:** B-010

**Classification:**

**Description:** Bulk Sample 10

**Results:**  
A: Non-Asbestos: 1% Cellulose Fibers in White Drywall  
B: Non-Asbestos: 90% Cellulose Fibers in Brown Paper

**Analysis Number:** 153615-11

**Customer Number:** B-011

**Classification:**

**Description:** Bulk Sample 11

**Results:** Asbestos: 2% Chrysotile in Black/Brown Mastic

**Analysis Number:** 153615-12

**Customer Number:** B-012

**Classification:**

**Description:** Bulk Sample 12

**Results:** Non-Asbestos: Non-Fibrous Brown Mastic

- All samples tested as submitted to the lab. H.M. PITT LABS, INC. does not assume responsibility for the accuracy of the information submitted with the samples unless done by an employee of H.M. PITT LABS, INC.
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- Samples are archived for 2 years from date of receipt and will be disposed of properly following this period.
- Quantitative value is based on PLM CVES (Calibrated Visual Estimates) with a detection limit of <1%.

**APPROVED BY:**   
LELAND S. PITT, CIH

**Dated:** 11/28/2016

**REVIEWED BY:**   
Michelle Lavallee





**CITY OF SAN DIEGO**  
**Environmental Services Department**  
**ALMP/ILSHHP - Laboratory Submittal**

153615

72 HR  
 TAT - PLM



Project # 7106 Submitted by: Jessica Weislogel Date: 11/21/2016 Page 1 of 2

LAB SUBMITTED TO: H. M. Pitt

TURNAROUND TIME:  
 2 HOUR  24 HOUR  48 HOUR  72 HOUR  5 DAY  OTHER:

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- Lab reports/invoices are to contain the Project Number listed above. Do not include Purchase Order Numbers on Invoices
- Email report to: *JWeislogel@sandiego.gov*

Lab Number	Sample No.	Location	Media	Time On/Off	Flow	Volume	Analyses Requested
	Sample # Prefix: 7106						
B-001	Bulk Sample 1	Bulk					PLM
B-002	Bulk Sample 2	Bulk					PLM
B-003	Bulk Sample 3	Bulk					PLM
B-004	Bulk Sample 4	Bulk					PLM
B-005	Bulk Sample 5	Bulk					PLM
B-006	Bulk Sample 6	Bulk					PLM
B-007	Bulk Sample 7	Bulk					PLM
B-008	Bulk Sample 8	Bulk					PLM
B-009	Bulk Sample 9	Bulk					PLM
B-010	Bulk Sample 10	Bulk					PLM

NOTES:

Relinquished by: *[Signature]* Date/Time: 11/23/16 11:30

Received by: *[Signature]* Date/Time: 11/23/16 12:30



**CITY OF SAN DIEGO**  
**Environmental Services Department**  
**ALMP/LSHHP - Laboratory Submittal**



153615

Project # **7106** Submitted by: **Jessica Weislogel** Date: **11/21/2016** Page 1 of 1

LAB SUBMITTED TO: **H.M. Pitt** TURNAROUND TIME:  2 HOUR  24 HOUR  48 HOUR  72 HOUR  5 DAY  OTHER:

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2. Lab reports/invoices are to contain the Project Number listed above. Do not include Purchase Order Numbers on Invoices
3. Email report to: [JWeislogel@sandiego.gov](mailto:JWeislogel@sandiego.gov)

Lab Number	Sample No.	Location	Media	Time On/Off	Flow	Volume	Analyses Requested
	B-001	Bulk Sample- 11	Bulk	/			PLM
	B-002	Bulk Sample-12	Bulk	/			PLM

NOTES:

Relinquished by: **Jessica Weislogel**  
 Date/Time: **11/23/2016**  
 Received by: **[Signature]**  
 Date/Time: **11/23/16**



**H.M. Pitt Labs, Inc.**  
4901 Morena Blvd · Ste 203 · San Diego, CA 92117

**Lab Number: 153816-206684**  
Tel: 619-474-8548 · Fax: 858-412-3305

**Company:**  
City of San Diego Environmental Services  
Department  
9601 Ridgehaven Court, Suite 310  
San Diego, CA 92123

**Date Entered:** 12/09/2016  
**Analyzed By:** Michelle Lavallee

**Date Analyzed:** 12/09/16  
**Customer PO / Claim#:**  
**Contract Number:**

**Job Site:** Project #7105  
**Lab Notes:** 24 HR TAT

**Date Sampled** **Who Sampled**  
12/08/2016 George Katsikaris

**POLARIZED LIGHT MICROSCOPY ANALYSIS REPORT - EPA-600/R-93/116 AND EPA-600/M4-82-020**

**Analysis Number:** 153816-1  
**Customer Number:** B-001  
**Classification:** **Description:** 9"x9" VCT Under Carpet w/ Mastic  
**Results:** A: Asbestos: 4% Chrysotile in Tan Floor Tile  
B: Asbestos: 5% Chrysotile in Black Mastic  
C: Non-Asbestos: Non-Fibrous Tan Mastic

**Analysis Number:** 153816-2  
**Customer Number:** B-002  
**Classification:** **Description:** 9"x9" VCT Under Carpet w/ Mastic  
**Results:** A: Asbestos: 4% Chrysotile in Tan Floor Tile  
B: Asbestos: 5% Chrysotile in Black Mastic  
C: Non-Asbestos: Non-Fibrous Tan Mastic

**Analysis Number:** 153816-3  
**Customer Number:** B-003  
**Classification:** **Description:** 9"x9" VCT Under VSF w/ Mastic  
**Results:** A: Asbestos: 4% Chrysotile in Tan Floor Tile  
B: Asbestos: 5% Chrysotile in Black Mastic  
C: Non-Asbestos: 25% Cellulose Fibers in Gray Sheet Vinyl

**Analysis Number:** 153816-4  
**Customer Number:** B-004  
**Classification:** **Description:** Base Cove - Grey  
**Results:** Non-Asbestos: Non-Fibrous White Cove Base Mastic

- All samples tested as submitted to the lab. H.M. PITT LABS, INC. does not assume responsibility for the accuracy of the information submitted with the samples unless done by an employee of H.M. PITT LABS, INC.
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**APPROVED BY:**   
LELAND S. PITT, CIH

**Dated:** 12/08/2016

**REVIEWED BY:**   
Michelle Lavallee



# H.M. Pitt Labs, Inc.

4901 Morena Blvd · Ste 203 · San Diego, CA 92117

# Lab Number: 153816-206684

Tel: 619-474-8548 · Fax: 858-412-3305

**Company:**

City of San Diego Environmental Services  
Department  
9601 Ridgehaven Court, Suite 310  
San Diego, CA 92123

**Date Entered:** 12/09/2016

**Analyzed By:** Michelle Lavallee

**Date Analyzed:** 12/09/16

**Customer PO / Claim#:**

**Contract Number:**

**Job Site:** Project #7105

**Date Sampled**

**Who Sampled**

**Lab Notes:** 24 HR TAT

12/08/2016

George Katsikaris

## **POLARIZED LIGHT MICROSCOPY ANALYSIS REPORT - EPA-600/R-93/116 AND EPA-600/M4-82-020**

**Analysis Number:** 153816-5

**Customer Number:** B-005

**Classification:**

**Description:** Base Cove - Black

**Results:** Non-Asbestos: Non-Fibrous White Cove Base Mastic

**Analysis Number:** 153816-6

**Customer Number:** B-006

**Classification:**

**Description:** Plaster Wall

**Results:** Non-Asbestos: Non-Fibrous White Plaster

**Analysis Number:** 153816-7

**Customer Number:** B-007

**Classification:**

**Description:** Plaster Wall

**Results:** Non-Asbestos: Non-Fibrous White Plaster

**Analysis Number:** 153816-8

**Customer Number:** B-008

**Classification:**

**Description:** Exterior Stucco

**Results:** Non-Asbestos: Non-Fibrous Gray Stucco

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**APPROVED BY:**

LELANO S. PITT, CIH

**Dated:** 12/08/2016

**REVIEWED BY:**

Michelle Lavallee

Page 2 of 3



**H.M. Pitt Labs, Inc.**  
4901 Morena Blvd · Ste 203 · San Diego, CA 92117

**Lab Number: 153816-206684**  
Tel: 619-474-8548 · Fax: 858-412-3305

**Company:**  
City of San Diego Environmental Services  
Department  
9601 Ridgehaven Court, Suite 310  
San Diego, CA 92123

**Date Entered:** 12/09/2016  
**Analyzed By:** Michelle Lavallee

**Date Analyzed:** 12/09/16  
**Customer PO / Claim#:**  
**Contract Number:**

**Job Site:** Project #7105

**Date Sampled**    **Who Sampled**  
12/08/2016        George Katsikaris

**Lab Notes:** 24 HR TAT

**POLARIZED LIGHT MICROSCOPY ANALYSIS REPORT - EPA-600/R-93/116 AND EPA-600/M4-82-020**

**Analysis Number:** 153816-9

**Customer Number:** B-009

**Classification:**

**Description:** Exterior Stucco

**Results:** Non-Asbestos: Non-Fibrous Gray Stucco

- All samples tested as submitted to the lab. H.M. PITT LABS, INC. does not assume responsibility for the accuracy of the information submitted with the samples unless done by an employee of H.M. PITT LABS, INC.
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**APPROVED BY:**   
LELAND S. PITT, CIH

**Dated:** 12/08/2016

**REVIEWED BY:**   
Michelle Lavallee



24 HR  
TAT - PLM



CITY OF SAN DIEGO  
Environmental Services Department  
ALMP/LSHHP - Laboratory Submittal

153816



Project # 7105 Submitted by: George Katsikaris Date: 12/8/2016 Page 1 of 1

LAB SUBMITTED TO: HM Pitt

TURNAROUND TIME:  
 2 HOUR  24 HOUR  48 HOUR  72 HOUR  5 DAY  OTHER:

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- Lab reports/invoices are to contain the Project Number listed above. Do not include Purchase Order Numbers on Invoices
- Email report to: gkatsikaris@sandiego.gov

Lab Number	Sample No.	Location	Media	Time On/Off	Flow	Volume	Analyses Requested
	B-001	9"x9" VCT Under Carpet w/Mastic	Bulk				PLM
	B-002	9"x9" VCT Under Carpet w/Mastic					
	B-003	9"x9" VCT Under VSF w/Mastic					
	B-004	Base Cove - Grey					
	B-005	Base Cove - Black					
	B-006	Plaster Wall					
	B-007	Plaster Wall					
	B-008	Exterior Stucco					
	B-009	Exterior Stucco					

NOTES:

Relinquished by: *[Signature]* Relinquished by: *[Signature]*

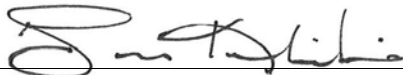
Date/Time: 12/8/16 13:20 Date/Time: 12/15/16

Received by: *[Signature]* Received by: *[Signature]*

Date/Time: 12/9/16 Date/Time: 12/9/16 09:30

**LEAD CONTAINING MATERIALS**  
**ABATEMENT SPECIFICATION**  
**for**  
**FIRE STATIONS 3, 8, 15**  
**January 3, 2017**

Prepared by:



George Katsikaris

Asbestos & Lead Program Inspector

CDPH IA/PM License# 20618

Reviewed by:



Michael Anderson

Asbestos & Lead Program Inspector

CDPH IA/PM License# 17780

City of San Diego  
Environmental Services Department  
Disposal & Environmental Protection  
Asbestos & Lead Management Program  
9601 Ridgehaven Court, Ste 320  
San Diego, CA 92123  
Tel: (858) 492-5086  
Fax: (858) 492-5089

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## I. GENERAL REQUIREMENTS

### A. DESCRIPTION OF WORK

1. ABATEMENT CONTRACTOR shall supply all labor, transportation, material, apparatus, and equipment for the removal, and disposal of lead containing materials to be impacted as a result of this project, as identified in Appendix C of this section. A summary of lead containing materials in each Fire Station follows:

a) Fire Station 15

(1) Interior door jambs, casings and windows throughout contain lead in good condition.

(2) Exterior eaves, trim, fascia, doors, door jambs and casings and windows throughout contain lead in good condition

(3) Ceramic wall tile within the Captains Bathroom contains lead and is in good condition.

b) Fire Station 8

(1) Ceramic wall tile throughout the kitchen area contains lead and is in good condition.

c) Fire Station 3

(1) Ceramic wall and counter tile throughout the kitchen and restrooms contains lead and is in good condition.

2. ABATEMENT CONTRACTOR shall be responsible for ensuring the surrounding areas will not be contaminated with lead containing materials during work and shall be responsible for any clean-up determined necessary by City of San Diego's PROJECT MONITOR.

3. Before submitting his/her bid, the ABATEMENT CONTRACTOR shall visit the project site and verify the location of the lead containing materials that will be removed under the terms and conditions of the contract and this specification.

4. All paint chips collected must be stored in sealable drum containers (not in bags).

5. Abatement work shall be performed within agreed upon hours submitted prior to project start which will not include designated City holidays.

6. Before the beginning of abatement work the ABATEMENT CONTRACTOR shall hold a safety construction meeting with all abatement supervisors, workers, and other contractors on-site that provides an overview of the accepted work plan, decontamination procedures specific to this project (decontamination procedures shall be on paper with copies for all present), and disposal plan for this project. Meeting shall include the PROJECT MONITOR and any other designated City representative.

B. CONTRACTOR USE OF THE PREMISES

1. All site rules and regulations affecting the work should be complied with while engaged in project activities. The existing building should be maintained in a safe condition throughout the abatement activities. The ABATEMENT CONTRACTOR will be responsible for adhering to all applicable building codes and fire safety requirements.
2. All public areas will be kept free of accumulated waste, materials, rubbish, and debris.

C. PROJECT COORDINATION

1. It will be the responsibility of the ABATEMENT CONTRACTOR to coordinate all site activities with the City's Asbestos & Lead Management Program's (ALMP) PROJECT MONITOR including any meetings, surveys, special reports, and site usage limitations.

D. PROJECT SUBMITTALS

The ABATEMENT CONTRACTOR shall not commence any work until approval has been given from the City. The ABATEMENT CONTRACTOR shall submit the following at least 30 days prior to commencement of any lead abatement activities:

1. Lead Abatement Work Plan:
  - a) Submit a detailed job-specific plan that includes:
    - (1) The procedures proposed to comply with the requirements of this specification and all applicable regulations.
    - (2) Detailed drawings that identify the location, size, layout and details of the Work Areas, any equipment, disposal storage, restrooms, and worker decontamination facilities.
    - (3) The sequencing of abatement work and the interface of trades involved in the performance of work. Provide a time line that details each major phase of work activity and anticipated time it will occur.
    - (4) The methods to be used to assure the safety of occupants and visitors to the site.
    - (5) A description of methods to be used to control dispersion of hazardous materials to the interior and exterior of the building.
    - (6) The method of removal to minimize dust generation in the Work Area.
  - b) Work site coordination submittals including:
    - (1) Contingency and Spill Plan: Prepare a contingency plan for emergencies including fire, accident, power failure, or any other event that may require modification or abridgement of

decontamination or Work Area isolation procedures. Include in plan specific procedures for decontamination or Work Area isolation. Plan should be specific for all types of hazardous materials or situations specific to this work site. Note that nothing in this specification should impede safe exiting or providing of adequate medical attention in the event of an emergency.

(2) Telephone numbers and locations of emergency services including but not limited to fire, ambulance, doctor, hospital, police, power company, telephone company.

2. Notifications:

a) Prior to any abatement activities the ABATEMENT CONTRACTOR must submit a CDPH Form 8551 (Abatement of Lead Hazards Notification) to the Compliance and Enforcement Unit of the CLPPB. The Form 8551 must be posted at the entrances to the property at least 5 days prior and during abatement activities.

b) Submit Cal/OSHA pre-job notification for lead-related construction work per Title 8 CCR 1532.1 subsection (p), "Lead-Work Pre-Job Notification".

c) Permits, notifications, and licenses needed to perform work (including hazardous waste hauler's registration)

d) Notify emergency service agencies including fire, ambulance, police or other agency that may service the abatement work site in case of an emergency. Notification is to include methods of entering Work Area, emergency entry and exit locations, modifications to fire notification or fire-fighting equipment, and other information needed by agencies providing emergency services.

e) Notifications of Emergency: Any individual at the job site may notify emergency service agencies if necessary without effect on this contract or the Contract Sum.

f) Provide submittal identifying person responsible for responding to project site emergencies twenty-four hours a day, seven days a week.

3. ABATEMENT CONTRACTOR qualifications and personnel information submittals that include but are not limited to:

a) Provide all staff names, certifications, and experience. Identify their duties and responsibilities on this project. ABATEMENT CONTRACTOR shall have the following minimum levels of qualified supervision on the project site:

(1) General Superintendent: Provide a full-time General Superintendent who is experienced in administration and supervision of lead abatement projects including work practices, protective measures for building and personnel, disposal procedures, etc. This person is the ABATEMENT CONTRACTOR's representative

responsible for compliance with all applicable federal, state and local regulations and guidelines, particularly those relating to lead abatement and hazardous waste. Should, in the opinion of the OWNER, any language barrier exist between the on-site superintendent and the OWNER or PROJECT MONITOR, the ABATEMENT CONTRACTOR shall employ a qualified full-time interpreter or provide a new on-site superintendent at no additional cost to the OWNER. Shall be CDPH certified as a Lead Supervisor.

(2) Foreman: Provide a full time Foreman to directly supervise and direct no more than 10 lead workers. Each Foreman will act as the Competent Person for the workers the foreman is directing. The Foreman has oversight authority over the workers and reports to the General Superintendent. If there are 10 or fewer abatement workers on the project the General Superintendent may fill the Foreman's position. Shall be CDPH certified as a Lead Supervisor.

(3) Experience and Training: The General Superintendent and foreman shall meet all the training requirements as a Supervisor in accordance with Title 17, California Code of Regulations, Division 1, Chapter 8. They shall also have experience with projects of similar types and sizes.

(4) Workers: All abatement workers shall have current certifications as a Lead Worker in accordance with Title 17, California Code of Regulations, Division 1, Chapter 8.

(5) Certificate of Worker's Acknowledgment: Submit an original signed copy of the Certificate of Worker's Acknowledgment found in Appendix A of this section, for each worker and supervisor who is to be at the job site or enter the Work Area.

b) Identify state licensed transporter, disposal location, and associated permits for all hazardous waste.

c) Submit respiratory protection information and air monitoring data as per the following:

(1) Operating Instruction: Submit complete operating and maintenance instructions for all components and systems as a whole. Submittal is to be in bound manual form suitable for field use.

(2) Respiratory Protection Program: Submit ABATEMENT CONTRACTOR's written respiratory protection program manual as required by 8 CCR 1531 and 5144.

(3) Respiratory Protection Schedule: Submit level of respiratory protection intended for each operation required by the project.

- (4) Copies of current respirator fit test: Fit tests must be performed every 6 months.
- d) Submit doctor's report from medical examination conducted within the last 12 months as part of compliance with OSHA medical surveillance requirements for each worker who is to enter the Work Area. Submit, at a minimum, the following for each worker:
  - (1) Name and Social Security Number
  - (2) Copies of Blood Lead Levels and Zinc Protoporphyrin tests
  - (3) Physicians Written Opinion from examining physician including at a minimum the following:
    - (a) Whether worker has any detected medical conditions that would place the worker at an increased risk of material health impairment from exposure to lead. Any recommended limitations on the worker or on the use of personal protective equipment such as respirators.
    - (b) Statement that the worker has been informed by the physician of the results of the medical examination and of any medical conditions that may result from lead exposure.
- e) Submit a notarized certification, signed by an officer of the ABATEMENT CONTRACTOR firm that exposure measurements, medical surveillance, and worker training records are being kept in conformance with 8 CCR 1529.
- f) Identify the laboratory that will be performing the analysis of the personal samples and provide their accreditation. Also discuss the method by which the ABATEMENT CONTRACTOR will provide the analytical results to the PROJECT MONITOR within 24 hours of sampling completion.
- 4. Submit the following during and at the completion of the work
  - a) Copies of all Waste Shipment Records
  - b) Copies of all air monitoring results within 24 hours
- 5. At the end of a project, the ABATEMENT CONTRACTOR shall submit the following to the PROJECT MONITOR:
  - a) Personal Air Sample Results
  - b) Copies of Project Daily Logs
  - c) Containment Entry/Exit Logs
  - d) Waste Disposal Documentation
  - e) Certificate of Visual Inspection

E. SCHEDULES AND REPORTS

- 1. Prior to each phase of project, the ABATEMENT CONTRACTOR shall provide the City with a tentative time line which outlines the project schedule. These

documents will be reviewed and approved by the City prior to the commencement of work.

F. PRODUCT DATA

1. The ABATEMENT CONTRACTOR shall submit product information that is to be used during the abatement activities prior to commencement of work (i.e., encapsulants). General information required includes manufacturer's standard printed recommendations for application and use, compliance with recognized standards of trade association and testing agencies, and safety data sheets (SDSs).

2. Polyethylene sheet

a) A single polyethylene film in the largest sheet size possible to minimize seams, 4.0 or 6.0 mil thick as indicated, and clear, frosted, or black as indicated.

b) Provide flame resistant polyethylene film that conforms to requirements set forth by the National Fire Protection Association Standard 701, Small Scale Fire Test for Flame-resistant Textiles and Films. Provide largest size possible to minimize seams, 4.0 or 6.0 mil thick as indicated, and frosted or black as indicated.

c) Reinforced Polyethylene Sheet: Where plastic sheet is the only separation between the Work Area and building exterior, provide translucent, nylon reinforced, laminated, flame resistant, polyethylene film that conforms to requirements set forth by the National Fire Protection Association Standard 701, Small Scale Fire Test for Flame-resistant Textiles and Films. Provide largest size possible to minimize seams, 4.0 or 6.0 mil thick as indicated, frosted or black as indicated.

3. Tape

a) Provide duct tape in 2" or 3" widths as indicated, with an adhesive which is formulated to stick aggressively to sheet polyethylene.

4. Spray adhesive

a) Provide spray adhesive in aerosol cans which is specifically formulated to stick tenaciously to sheet polyethylene.

G. PROJECT CLOSE-OUT

1. Upon completion of work and prior to payment, the PROJECT MONITOR will proceed with an initial inspection of the abatement work area. A Certificate of Visual Inspection (Appendix B) will be signed by both the ABATEMENT CONTRACTOR and PROJECT MONITOR. The ABATEMENT CONTRACTOR will not be paid until the area meets the established project-specific clearance criteria and has submitted the required information.

## II. DEFINITIONS

- A. **ABATEMENT:** Any set of measures designed to permanently eliminate lead based paint hazards including paint removal, building component removal, or near-permanent enclosure of lead based paint hazards.
- B. **ABATEMENT CONTRACTOR:** The designated sub-contractor performing the required abatement work outlined in this specification.
- C. **ACCREDITED or ACCREDITATION (when referring to a person or laboratory):** A person or laboratory accredited in accordance with section 206 of Title II of the Toxic Substances Control Act (TSCA).
- D. **ACTION LEVEL:** An 8-hour time weighted average (TWA) lead airborne concentration of 30 µg/m<sup>3</sup>.
- E. **AIR MONITORING:** The process of measuring the lead content of a specific volume of air.
- F. **AUTHORIZED VISITOR:** The Owner, the Owner's Representative, testing lab personnel, the Architect/Engineer, emergency personnel or a representative of any federal, state and local regulatory or other agency having authority over the project.
- G. **BARRIER:** Any surface that seals off the work area to inhibit the movement of dust.
- H. **BREATHING ZONE:** A hemisphere forward of the shoulders with a radius of approximately 6 to 9 inches.
- I. **CONTAINMENT:** A process for protecting both workers and environment by controlling exposures to lead dust and debris created during abatement.
- J. **CONTAMINATE:** Refers to lead-containing dust/debris.
- K. **DEMOLITION:** The wrecking or taking out of any building component, system, finish or assembly of a facility together with any related handling operations.
- L. **DISPOSAL BAG:** A properly labeled 6 mil thick leak tight plastic bags used for transporting lead waste from work site to disposal site.
- M. **ENCAPSULATION:** Any covering or coating that acts as a barrier between lead based paint and the environment and that relies on adhesion and the integrity of the existing paint bonds between layers and with the substrate for its durability.
- N. **ENCLOSURE:** The use of rigid durable construction materials that are mechanically fastened to the substrate in order to act as a barrier between lead based paint and the living or work space.
- O. **HEPA FILTER:** A high Efficiency Particulate Air (HEPA) filter capable of trapping and retaining 99.97% of all mono-dispersed particles greater than 0.3 microns in diameter or larger.

- P. HEPA FILTER VACUUM COLLECTION EQUIPMENT (or vacuum cleaner): High efficiency particulate air filtered vacuum collection equipment with a filter system capable of collecting and retaining lead.
- Q. HIGH PHOSPHATE DETERGENT: Detergent which contains at least 5% tri sodium phosphate.
- R. LEAD: Means metallic lead, all inorganic lead compounds, and organic lead soaps.
- S. LEAD-BASED PAINT (LBP): For purposes of this project, LBP refers to the materials identified in these specifications as having paint or coatings that contains lead.
- T. LEAD-RELATED CONSTRUCTION SUPERVISOR: Means an individual who is responsible for implementing lead-related construction work and enforcing work practices. This person must have received certification as a lead-related construction Supervisor.
- U. LEAD-RELATED CONSTRUCTION WORK: Means any construction, alteration, painting, demolition, salvage, renovation, repair, or maintenance of a building, including preparation and cleanup, by disturbing lead-containing material that may result in exposure of individuals to lead.
- V. LEAD-RELATED CONSTRUCTION WORKER: Means any individual who performs lead-related construction work in a building under the direction of lead-related construction Supervisor, and has received certification as a lead-related construction Worker.
- W. OWNER: Refers to the City of San Diego
- X. PAINT FILM STABILIZATION: The process of using wet scraping, priming, and repainting a deteriorated lead based paint film in a dwelling including clean-up and clearance.
- Y. PAINT REMOVAL: A strategy of abatement which entails removing lead based paint form surfaces of components using chemicals, heat guns below 11000F, and certain contained abrasive methods but not open flame burning, open abrasive blasting, sandblasting, water blasting, extensive dry scraping, or methylene chloride removers.
- Z. PERMISSIBLE EXPOSURE LIMIT (PEL): An 8-hour TWA lead airborne concentration of 50 µg/m<sup>3</sup>.
- AA. PERSONAL MONITORING: Sampling of contaminant concentrations within the breathing zone of an employee.
- BB. PROJECT MONITOR: City of San Diego Asbestos & Lead Management Program staff or their designated consultant.
- CC. PROTECTION FACTOR: The ratio of the ambient concentration of an airborne substance to the concentration of the substance inside the respirator at the



breathing zone of the wearer. The protection factor is a measure of the degree of protection provided by a respirator to the wearer.

- DD. RRP: EPA's Renovation, Repair and Painting certification that requires contractor training and lead-safe work practices when performing renovation type activities in housing built prior to 1978.
- EE. REPLACEMENT: A strategy of abatement which entails the removal of components such as windows, doors, and trim that have lead painted surfaces and installing new components free of lead paint.
- FF. RESPIRATOR: A device designed to protect the wearer from the inhalation of harmful contaminants.
- GG. TESTING LABORATORIES: A "testing laboratory" is an entity engaged to perform specific inspections or tests, either at the project site or elsewhere, and to report on, and, if required, to interpret results of, those inspections or tests.
- HH. TIME-WEIGHTED AVERAGE (TWA): The average concentration of a contaminant in air during a specific time period.
- II. TRIGGER TASKS: Work tasks that require an employer to assume specified employee exposures until the employer has performed an exposure assessment [see T8CCr, 1532.1 (d) (2)].
- JJ. WET CLEANING: The process of eliminating lead contamination from building surfaces and objects by using cloths, mops, or other cleaning utensils which have been dampened with amended water or diluted removal encapsulant and afterwards thoroughly decontaminated or disposed of appropriately.
- KK. WORK AREA: The area where abatement work operations are performed which is defined and/or isolated to prevent the spread of contamination, and entry by unauthorized personnel.

### III. SITE WORK

#### A. INTRODUCTION

This portion of the specification describes procedures and protocols for abatement activities. The protocols/procedures described hereafter are in accordance with federal/state/local requirements. In the absence of these requirements, the procedure/protocols are based on current industry standards.

#### B. BACKGROUND INFORMATION

Sampling of building materials has been performed by inspectors from the City's Asbestos and Lead Management Program (ALMP) and has been provided in Appendix C of this specification. The ABATEMENT CONTRACTOR shall visit the project site and verify the location and quantities of the lead containing materials

that will be removed under the terms and conditions of the contract and this specification. If any materials to be impacted have not been previously tested contact ALMP for further sampling. Untested painted surfaces must be assumed as lead containing and handled accordingly.

C. GENERAL INFORMATION

1. Potential Hazards

a) The disturbance of lead containing materials may cause exposure to workers and building occupants. All workers, supervisory personnel, subcontractors, and consultants who will be at the job site, need to be apprised of the seriousness of the hazard and of proper work practices which must be followed to minimize exposure. The procedures and methods described herein must be followed and the ABATEMENT CONTRACTOR must comply with all applicable federal/state/local requirements.

2. Stop Work

a) If the PROJECT MONITOR presents a verbal or written stop work order, the ABATEMENT CONTRACTOR shall immediately and automatically stop all work. Recommencement of the work may not begin until authorized by the PROJECT MONITOR.

D. PROJECT ADMINISTRATION

1. Certified Supervisor

The ABATEMENT CONTRACTOR needs to provide a full-time lead abatement supervisor who is experienced in administration and supervision of lead abatement projects including work practices, protective measures for building and personnel, disposal procedures, etc. This supervisor must have a current CDPH Lead Supervisor certificate. This person will act as the competent person on the job.

In addition, all employees working on the project must have current CDPH Lead Worker certification.

E. SPECIAL REPORTS

1. Reporting Unusual Events

When an event of unusual and significant nature occurs at the site (e.g., a spill of lead debris, failure of special equipment used to contain lead), the ABATEMENT CONTRACTOR shall prepare and submit a special report listing the chain of events, persons participating, response by Contractor's personnel, evaluation of results, and other pertinent information.

2. Reporting Accidents

The ABATEMENT CONTRACTOR shall prepare and submit reports of significant accidents at the subject site. Pertinent data and actions need to be recorded. In addition, response actions should comply with industry standards. For this purpose, a significant accident is defined to include events where personal injury or property

loss of substance is sustained, or where the event posed a significant threat of loss or personal injury or potential environmental contamination.

F. COMPLIANCE WITH CODES AND REGULATIONS

1. Except to the extent that more explicit, or more stringent requirements are written directly into this Abatement Contract/Specification, all applicable codes, regulations, and standards have the same force and effect (and are made a part of the contract documents by reference) as if copied directly into the contract documents, or as if published copies are bound herewith.

2. The ABATEMENT CONTRACTOR will assume full responsibility and liability for the compliance with all applicable federal/state/local regulations pertaining to work practices, protection of workers, and visitors to the site, persons occupying areas adjacent to the site, hauling, and disposal of waste. The ABATEMENT CONTRACTOR shall hold the City and its representative harmless for the ABATEMENT CONTRACTOR's failure to comply with any applicable work, hauling, disposal, safety, health, or other regulation on the part of itself, its employees, or its subcontractors,

3. State requirements which govern lead hazard control activities or hauling and disposal of hazardous waste include, but are not limited to, the following:

a) California Occupational Safety and Health Administration (Cal/OSHA):

- (1) Division of Industrial Safety; Chapter 4
- (2) 8CCR, Section 1532.1, Lead in Construction
- (3) 8CCR, Section 5194, Hazard Communication Standard
- (4) 8CCR, Section 1531, Construction Respiratory Protection Standard
- (5) 8CCR, Section 1514, Construction Personal Protective Equipment
- (6) 8CCR, Section 1509, Construction Injury Illness Prevention Program
- (7) 8CCR, Section 6003-4, Accident Prevention Signs and Tags
- (8) 8CCR, Section 3204, Access to Employee Exposure Medical Records

b) California Environmental Protection Agency (Cal/EPA):

- (1) 22CCR, Division 4.5, Environmental Health Standards for the Management of Hazardous Waste.

c) California Department of Public Health (CDPH):

- (1) 17CCR, Division 1, Chapter 8, Accreditation of training providers and interim certification of individuals engaged in lead-related construction work.

4. Federal requirements which govern lead hazard control activities or hauling and disposal of hazardous waste include, but are not limited to, the following:
  - a) Federal Environmental Protection Agency (FED/EPA):
    - (1) Hazardous Waste Standards, 40 Code of Federal Regulations (CFR), Part 261
    - (2) EPA Renovate, Repair, Painting (RRP), 40 CFR 745, Subpart E.
  - b) U.S. Department of Transportation (DOT):
    - (1) Hazardous Substances, 49CFR, Parts 171 through 180
  - c) American National Standards Institute, Inc. (ANSI):
    - (1) Z9.2-79 Fundamentals Governing the Design and Operation of Local Exhaust
    - (2) Z88.2-80 Practices of Respiratory Protection
  - d) Department of Housing and Urban Development (HUD):
    - (1) Guidelines for the Evaluation and Control of Lead Based Paint Hazards in Housing (most current draft or final copy)
5. In addition, the ABATEMENT CONTRACTOR must comply with any applicable regulations promulgated as a result of Title X, the Residential Lead Based Paint Hazard Reduction Act and Title IV, Lead Exposure Reduction Act.
6. Local requirements which govern lead hazard control activities include, but are not limited to, the following:
  - a) Air Pollution Control District (APCD) - San Diego County
    - (1) APCD Rules and Regulations, Rule 51 (Public Nuisance), Rule 10-11 (permitting of equipment)
  - b) San Diego Municipal Code §54.1001 etc. seq.
    - (1) Prevents, identifies and remedies lead hazards within the City of San Diego

**G. PERMITS AND LICENSES**

The ABATEMENT CONTRACTOR shall submit to the City in the bid submittal any permits or licenses necessary to carry out this work.

**1. Permits**

A valid Hazardous Waste Hauler registration is required for transporting any hazardous waste. Certain types of equipment require APCD permits (e.g., abrasive blasters).

**2. Licenses**

The ABATEMENT CONTRACTOR must be certified by the California Contractors State License Board. The Contractor, or its subcontractor, shall have current licenses, as

required by all applicable state or local jurisdictions for the removal, transportation, disposal, or other regulated activity relative to the work described in this plan.

#### H. HEALTH AND SAFETY

This section describes the equipment and procedures required for protecting workers from Lead contamination and other workplace hazards.

1. Provide worker protection as required by the most stringent OSHA and/or EPA standards applicable to the work.
2. Training
  - a) ABATEMENT CONTRACTOR workers shall be trained in accordance with 8CCR, Section 1532.1 (lead). In addition, workers and supervisors must be lead-trained and have certification for lead-related work from the California Department of Public Health (CDPH).
  - b) Workers must be provided with initial biological monitoring (blood sampling) if they are occupationally exposed on any day to lead at or above the Action Level (AL). Employees must be provided with biological monitoring and a medical examination if they are occupationally exposed to lead above the action level for more than 30 days in any consecutive 12 month period. Periodic biological monitoring and medical examinations must be performed according to the schedule and criteria specified in T8CCR, Section 1532.1(j). In addition, employees performing “trigger” tasks must be included in biological monitoring and/or medical examinations based on their assumed exposure. In the absence of specific airborne exposure data, medical surveillance will need to be provided for all workers.
  - c) At a minimum, examinations shall meet all requirements as set forth in T8CCR, Section 1532.1. Furthermore, if an employee’s blood levels are at or above 20µg/dl they will not be allowed to work on the project and shall be medically removed until two consecutive blood lead tests show the employee’s blood lead level under 15µg/dl.
  - d) In addition, evaluations of each individual’s ability to work in environments capable of producing heat stress in the worker should be completed. Employees who wear respirators must be medically evaluated.
3. Protective clothing
  - a) Coveralls: Provide disposable “full body” coveralls and disposable head covers, and require that they be worn at all times by all workers in the Work Area. Provide a sufficient number for all required changes, for all workers in the Work Area.
  - b) Boots: Provide work boots with non-skid soles, and where required by OSHA, foot protection for all workers. Provide boots at no cost to workers. Do not allow boots to be removed from the Work Area for any reason, after being contaminated with lead containing material. Thoroughly

clean, decontaminate and bag boots before removing them from Work Area at the end of the work.

c) Hard Hats: Provide head protection (hard hats) as required by OSHA for all workers, and provide 1 spare for use by Owner's Representative, Project Administrator, and Owner. Require hard hats to be worn at all times that work is in progress that may potentially cause head injury. Provide hard hats of the type with plastic strap suspension. Require hats to remain in the Work Area throughout the work. Thoroughly clean, decontaminate and bag hats before removing them from Work Area at the end of the work.

d) Goggles: Provide eye protection (goggles) as required by OSHA for all workers involved in scraping, spraying, or any other activity which may potentially cause eye injury. Thoroughly clean, decontaminate and bag goggles before removing them from Work Area at the end of the work.

e) Gloves: Provide work gloves to all workers and require that they be worn at all times in the Work Area. Do not remove gloves from Work Area and dispose of as lead contaminated waste at the end of the work.

#### 4. Respirators

##### a) Air Purifying Respirators

(1) Respirator Bodies: Provide half face or full face type respirators based upon appropriate protection factor as determined by the ABATEMENT CONTRACTORS competent person. .

(2) Filter Cartridges: Provide, at a minimum, HEPA type filters labeled with NIOSH and MSHA Certification for "Radionuclides, Radon Daughters, Dust, Fumes, Mists including Lead Containing Dusts and Mists" and color coded in accordance with ANSI Z228.2 (1980). In addition, a chemical cartridge section may be added, if required, for solvents, etc., in use. In this case, provide cartridges that have each section of the combination canister labeled with the appropriate color code and NIOSH/MSHA Certification.

(3) Non permitted respirators: Do not use single use, disposable or quarter face respirators.

(4) Require that respiratory protection be used at all times when there is any possibility of disturbance of lead containing or other hazardous materials whether intentional or accidental.

(5) Require that a respirator be worn by anyone in a Work Area at all times, regardless of activity, during a period that starts with any operation which could cause airborne dust until the area has been cleared for re occupancy.

(6) Regardless of Airborne Levels: Require that the minimum level of respiratory protection used be half face air purifying respirators with high efficiency filters.

- b) Fit testing
    - (1) Initial Fitting: Provide initial fitting of respiratory protection during a respiratory protection course of training. Only allow an individual to use respirators for which training and fit testing has been provided.
    - (2) Upon Each Wearing: Require that each time an air purifying respirator is put on it be checked for fit with a positive and negative pressure fit check in accordance with the manufacturer's instructions or ANSI Z88.2 (1980).
  - c) Respirators, disposable coveralls, head covers, and foot covers shall be provided by the ABATEMENT CONTRACTOR for the City of San Diego's Asbestos and Lead Management Program's PROJECT MONITOR, and other authorized representatives who may inspect the job site. Provide two (2) respirators and six (6) complete coveralls and, where applicable, six (6) respirator filter changes per day.
5. Materials and Equipment
    - a) Only material and equipment that are recognized as being suitable for the intended use, by compliance with appropriate standards, may be used.
  6. Water Service
    - a) The ABATEMENT CONTRACTOR will be able to obtain water services from on-site facilities. The City will designate the facilities from which water service may be obtained.
  7. Electrical Services
    - a) The ABATEMENT CONTRACTOR will be able to obtain electrical services from on-site facilities. The City will designate the facilities from which electrical services may be obtained. The ABATEMENT CONTRACTOR shall provide their own electrical hook-ups, i.e. spider boxes, ground fault circuit interrupter (GFCI) etc. and installed by a licensed electrician.
    - b) The electrical services need to comply with the applicable NEMA, NECA, and UL standards, and governing regulations for materials and lay-out of temporary electrical services.
  8. Sanitary Facilities
    - a) The ABATEMENT CONTRACTOR shall provide sanitary facilities on-site if none have been made available by the City.
  9. Fire Extinguisher
    - a) Applicable recommendations of the National Fire Protection Association (NFPA) Standard 10, "Standard for Portable Fire Extinguishers," must be complied with by the Contractor. Fire extinguishers need to be located where they are most convenient and effective for their intended

purpose, but not less than one (1) extinguisher in each work area, the equipment room, outside/work areas, and in the clean room.

10. First Aid

a) The ABATEMENT CONTRACTOR will need to provide first aid supplies which should comply with the governing regulations and recognized recommendations within the construction industry.

I. WORK AREA PROCEDURES

1. General guidelines for performing lead hazard control activities are presented in this section and are based on procedures established by HUD for residential settings. Due to the difference between residential settings and commercial buildings, these procedures will be modified on a case-by-case basis.
2. Require that workers NOT eat, drink, smoke, chew tobacco or gum, or apply cosmetics in the Work Area.
3. ABATEMENT CONTRACTOR shall secure work area from access by public, staff or users of the area. Accomplish this where possible, by locking doors, gates, or other means of access to the area.
4. Barricade fencing is required for securing an outside area from unauthorized access. Work area delineation shall occur at no less than twelve feet (12') from the radius of the work and/or building. Yellow caution tape shall not be used.
5. All windows, vents, mechanical systems, etc., in close proximity to the abatement area shall be sealed with plastic and tape by the ABATEMENT CONTRACTOR prior to the work beginning.
6. Warning signs for lead shall be posted as per 8CCR, Section 1532.1(m).
7. A visitor entry and exit-log, and an employee daily sign-in log will be maintained throughout the lead hazard control activities. The ABATEMENT CONTRACTOR shall be responsible for the project site security during the operations in order to protect work efforts and equipment.

J. REMOVAL OF LEAD CONTAINING MATERIALS

1. Lead containing materials shall be adequately wetted with water or a removal encapsulant before and during removal process, to reduce dust emission.
2. The ABATEMENT CONTRACTOR should exercise caution in using water, as he will be solely responsible for any water damage to the facility resulting from the work.
3. ABATEMENT CONTRACTOR is responsible for keeping all hazardous debris within the containment area at all times throughout removal. Any interior contamination, if created, is the responsibility of the ABATEMENT CONTRACTOR to clean with no additional cost to this contract.
4. ABATEMENT CONTRACTOR shall ensure there is no loose debris around the Work Area during the removal and if found, ABATEMENT CONTRACTOR shall clean the area immediately.



K. CLEANING

1. Daily cleaning includes removing large and small debris, HEPA vacuuming horizontal surfaces, wet mopping, and then HEPA vacuuming horizontal surfaces, and possible exterior cleaning.
2. Final cleaning must occur no sooner than one (1) hour after lead hazard control activities are finished. All plastic should be misted, cleaned, and folded toward the center to trap any remaining dust. The order of removal should be upper plastic, the first layer of floor plastic, vent and door plastic, the second layer of floor plastic, and finally plastic separating contaminated from non-contaminated areas. Then the entire area should be cleaned using a HEPA vacuum/wet wash/HEPA vacuum cycle. This should be from ceiling to floor. Paint or otherwise seal treated surfaces with the exception of interior floors (floors will be sealed after clearance). The Supervisor should perform an inspection for visible dust and debris.
3. Additional cleaning cycles may be necessary for porous surfaces, and difficult to clean surfaces (crevices). Failure to meet clearance criteria will require additional cleaning.

L. DECONTAMINATION PROCEDURE

1. Prior to leaving the Work Area, HEPA vacuum outer suit completely and remove, turning it inside out while doing so.
2. Proceed to decontamination area where the second suit is to be removed while turning it inside out.
3. After wiping all areas and respirator, remove respirator and wipe facial area clean.
4. Place contaminated suits, towels, and respirator cartridges in a properly labeled waste containers.
5. At the completion of the project, boots, hard hats, and goggles should be decontaminated and bagged prior to removal from the Work Area.
6. Equipment leaving the Work Area should be HEPA vacuumed and wet wiped.

M. CLEARANCE

1. Clearance must be performed by a California Department of Public Health (CDPH) Certified Lead PROJECT MONITOR. It will not be performed by the ABATEMENT CONTRACTOR (although the ABATEMENT CONTRACTOR may perform their own clearance testing). Clearance testing must occur no sooner than one (1) hour after final cleaning. It consists of two steps; visual examination and possibly environmental sampling (dust and/or soil sampling).
  - a) Visual Examination for Determination of Completed Work:
    - (1) This is a determination that the work specified in the scope of work has been completed satisfactorily. For surfaces that are to be re-painted, it is important this examination occurs prior to the re-painting (to determine that either all the paint has been removed

[abatement] or that the deteriorated paint has been stabilized [interim controls]). Next the surfaces should be examined for settled dust and debris. If dust or debris is visually noted, the ABATEMENT CONTRACTOR will be asked to re-clean prior to samples being collected.

(2) If no such dust/debris is found, the independent consultant or PROJECT MONITOR will complete a Certificate of Visual Inspection (Appendix B) for the area or for multiple areas. The Certified Supervisor will also sign this Certificate. The completed form should be submitted to the City at the end of the project.

2. Environmental Sampling:

a) The number and location of dust and/or soil samples will be determined on a case-by-case basis. The clearance criterion to be used is shown in the table below:

Surface Level

(1)	Interior Floors	40 µg/ft <sup>2</sup>
(2)	Interior Window Sills	250 µg/ft <sup>2</sup>
(3)	Exterior Horizontal Surfaces	400 µg/ft <sup>2</sup>
(4)	Exterior Soil*	1000 µg/ft <sup>2</sup>
(5)	Soil in Play Areas*	400 µg/ft <sup>2</sup>

b) Re-cleaning, at the Contractor's expense, will be required for surfaces that do not pass clearance criteria.

c) The cost for additional tests, which may be required as a result of samples failing to meet the release criteria, shall be paid for the Contractor. This cost shall include all costs associated with sample analysis and collection of additional samples, including Consultant fees.

\* Soil may not be impacted as a part of the proposed work but if contamination occurs then levels shall be used for clearances. ABATEMENT CONTRACTOR may take background soil samples to determine the preexisting soil conditions.

N. TRANSPORTATION AND DISPOSAL

1. Waste minimization

a) The ABATEMENT CONTRACTOR is required to make all reasonable efforts to minimize the amount of hazardous waste generated from this project.

2. Waste characterization

a) The ABATEMENT CONTRACTOR shall test any potential hazardous waste generated in accordance with 22 CCR Division 4.5 within ten (10) days and/or prior to the end of the project to determine if it is hazardous waste and requires disposal. All paint chips will be considered hazardous waste

and do not require testing. Components with lead paint that has been stabilized shall have a hazardous waste determination made prior to sending to a landfill.

3. Pre-transportation requirements
  - a) Any packaging used to ship hazardous waste off site such as a container, roll-off bin, tank or other device, must comply with 49 CFR Parts 173, 178, 179 and be labeled and prepared for transportation in accordance with 22 CCR Article 3.
  - b) The hazardous waste label must be affixed and filled out when the first amount of hazardous waste is placed in the container. The label must include the initial accumulation date.
  - c) All additional pre-transportation labeling, marking or placarding must be conducted prior to transporting off site and in accordance with 22 CCR Chapter 12, Article 3.
4. All containers and tanks of hazardous waste must be managed in a way which minimizes the threat of fire, explosion, or any unplanned sudden or non-sudden release of hazardous waste to the air, soil or surface water which could threaten human health or the environment. Management techniques include containment areas capable of holding the contents of largest container within the containment area. Properly store and secure waste at all times. Do not leave hazardous waste in uncovered or unlocked trucks or dumpsters.
5. A hazardous waste manifest will be completed in accordance with 22 CCR Chapter 12, Article 2 for each shipment of hazardous waste leaving the work site. All waste shall leave the project site by the end of the project. Only The PROJECT MONITOR employees shall sign as the generator on manifests.
6. Disposal of the lead related hazardous wastes shall be by incineration unless otherwise specified by the ALMP.
- 7.

## APPENDIX A

### CERTIFICATE OF WORKER'S ACKNOWLEDGMENT

PROJECT NAME: \_\_\_\_\_ DATE: \_\_\_\_\_

PROJECT ADDRESS: \_\_\_\_\_

CONTRACTOR'S NAME: \_\_\_\_\_

Working with lead can be dangerous. Inhaling and ingesting lead dust can cause an increase in blood lead levels which can lead to adverse health effects such as kidney damage, elevated blood pressure or infertility.

Your employer's contract with the City for the above project requires that: You be supplied with the proper respirator and be trained in its use. You be trained in safe work practices and in the use of the equipment found on the job. You receive a medical examination. These items are to have been done at no cost to you.

**RESPIRATORY PROTECTION:** You must have been trained in the proper use of respirators, and informed of the type respirator to be used on the above referenced project. You must be given a copy of the written respiratory protection manual issued by your employer. You must be equipped at no cost with the respirator to be used on the above project.

**TRAINING COURSE:** You must be licensed by the California Department of Public Health for Lead Hazard Control and be able to provide onsite documentation of training. You should have been trained in the dangers inherent in handling lead and breathing and ingesting lead dust and in proper work procedures and personal and area protective measures. The topics covered in the course must have included the following:

- Possible routes of exposure to lead
- Health hazards associated with lead
- Respiratory protection
- Use of protective equipment
- Work practices including hands on or on the-job training
- Personal decontamination procedures
- Health and safety considerations

**MEDICAL EXAMINATION:** You must have had a medical examination within the past 12 months at no cost to you. This examination must have included: health history, physical examination, a blood pressure measurement, pulmonary function test and blood sample and analysis for lead.

By signing this document you are acknowledging only that the City has advised you of your rights to training and protection relative to your employer, the Contractor.

Signature: \_\_\_\_\_ Social Security No.: \_\_\_\_\_

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

Witness (print): \_\_\_\_\_ Witness Signature: \_\_\_\_\_

APPENDIX B  
CERTIFICATION OF VISUAL INSPECTION

Project # \_\_\_\_\_ Date: \_\_\_\_\_ Location: \_\_\_\_\_

Contractor: \_\_\_\_\_

The contractor hereby certifies that he/she has visually inspected the Work Area (all surfaces including pipes, counters, ledges, walls, ceiling and floor, behind critical barriers, sheet plastic, etc.) and has found no dust, debris or residue.

by: (Signature): \_\_\_\_\_ Date: \_\_\_\_\_

(Print Name): \_\_\_\_\_

(Company Name): \_\_\_\_\_

(Print Title): \_\_\_\_\_

CITY ALMP REPRESENTATIVE

The City ALMP Representative hereby certifies that he has accompanied the contractor on his/her visual inspection and verifies that this inspection has been thorough and to the best of his/her knowledge and belief, the contractor's certification above is a true and honest one.

by: (Signature): \_\_\_\_\_ Date: \_\_\_\_\_

(Print Name): \_\_\_\_\_

WORK AREA

Location: \_\_\_\_\_

Room: \_\_\_\_\_

Hazard Reduction Performed:

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## APPENDIX C

### SUMMARY OF LEAD CONTAINING MATERIALS

STATION	READING	LOCATION	ROOM	COMPONENT	COLOR	RESULT	UNITS
15	6	Interior	Kitchen	Door Jamb	White	2.5	mg/cm <sup>2</sup>
15	9	Interior	Capt. Bath	Ceramic Wall Tile	Black	14.4	mg/cm <sup>2</sup>
15	18	Exterior	Exterior	Door Casing	Red	3.9	mg/cm <sup>2</sup>
15	23	Exterior	Exterior	Window Sill	Brown	3	mg/cm <sup>2</sup>
15	24	Exterior	Exterior	Door	Red	1.4	mg/cm <sup>2</sup>
15	25	Exterior	Exterior	Fascia	Red	2.8	mg/cm <sup>2</sup>
8	18	Interior	Kitchen	Ceramic Wall Tile	Yellow	6.6	mg/cm <sup>2</sup>
3	51	Interior	Kitchen	Ceramic Wall Tile	Beige	5.3	mg/cm <sup>2</sup>
3	52	Interior	Kitchen	Ceramic Wall Tile	Beige	4.7	mg/cm <sup>2</sup>
3	53	Interior	Kitchen	Ceramic Wall Tile	Beige	6.3	mg/cm <sup>2</sup>
3	73	Interior	Bathroom #2	Ceramic Wall Tile	Orange	6	mg/cm <sup>2</sup>
3	78	Interior	Bathroom #1	Ceramic Counter Top	Orange	6.5	mg/cm <sup>2</sup>

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**Fire Stations 3, 8, 15  
XRF Sample Data**

Reading No	Fire Station	Location	Room	Floor	Side	Component	Substrate	Color	Results	PbC	Units
5	3	Interior	ENGINE ROOM	1st	D	CEILING	WOOD	BEIGE	Negative	0	mg / cm ^2
6	3	Interior	ENGINE ROOM	1st	D	RAFTER	WOOD	BEIGE	Negative	0	mg / cm ^2
7	3	Interior	ENGINE ROOM	1st	D	JOIST	WOOD	BEIGE	Negative	0.01	mg / cm ^2
8	3	Interior	ENGINE ROOM	1st	D	TRIM	WOOD	BEIGE	Negative	0	mg / cm ^2
9	3	Interior	ENGINE ROOM	1st	C	WALL	WOOD	BEIGE	Negative	0.01	mg / cm ^2
10	3	Interior	ENGINE ROOM	1st	D	WALL	WOOD	BEIGE	Negative	0	mg / cm ^2
11	3	Interior	ENGINE ROOM	1st	B	WALL	DRYWALL	BEIGE	Negative	0.01	mg / cm ^2
12	3	Interior	ENGINE ROOM	1st	B	DOOR	METAL	RED	Negative	0	mg / cm ^2
13	3	Interior	ENGINE ROOM	1st	B	DOOR CASING	METAL	YELLOW	Negative	0	mg / cm ^2
14	3	Interior	ENGINE ROOM	1st	B	BASEBOARD	METAL	YELLOW	Negative	0	mg / cm ^2
15	3	Interior	OFFICE#1	1st	B	BASEBOARD	WOOD	YELLOW	Negative	0	mg / cm ^2
16	3	Interior	OFFICE#1	1st	B	WALL	DRYWALL	YELLOW	Negative	0	mg / cm ^2
17	3	Interior	OFFICE#1	1st	C	WALL	DRYWALL	YELLOW	Negative	0	mg / cm ^2
18	3	Interior	OFFICE#1	1st	D	WALL	DRYWALL	YELLOW	Negative	0	mg / cm ^2
19	3	Interior	OFFICE#1	1st	A	WALL	DRYWALL	YELLOW	Negative	0	mg / cm ^2
20	3	Interior	OFFICE#1	1st	A	DOOR STOP	DRYWALL	YELLOW	Negative	0	mg / cm ^2
21	3	Interior	OFFICE#1	1st	C	DOOR	DRYWALL	YELLOW	Negative	0	mg / cm ^2
22	3	Interior	OFFICE#1	1st	C	DOOR JAMB	WOOD	YELLOW	Negative	0	mg / cm ^2
23	3	Interior	OFFICE#1	1st	C	CEILING	DRYWALL	WHITE	Negative	0	mg / cm ^2
24	3	Interior	BATHROOM#1	1st	A	WALL	DRYWALL	YELLOW	Negative	0	mg / cm ^2
25	3	Interior	BATHROOM#1	1st	B	WALL	DRYWALL	YELLOW	Negative	0	mg / cm ^2
26	3	Interior	BATHROOM#1	1st	C	WALL	DRYWALL	YELLOW	Negative	0	mg / cm ^2
27	3	Interior	BATHROOM#1	1st	D	WALL	WOOD	ORANGE	Negative	0	mg / cm ^2
28	3	Interior	BATHROOM#1	1st	B	SHELF	WOOD	YELLOW	Negative	0	mg / cm ^2
29	3	Interior	BATHROOM#1	1st	A	DOOR	WOOD	YELLOW	Negative	0	mg / cm ^2
30	3	Interior	BATHROOM#1	1st		CEILING	WOOD	YELLOW	Negative	0	mg / cm ^2
31	3	Interior	HALL#1	1st		CEILING	WOOD	YELLOW	Negative	0.5	mg / cm ^2
32	3	Interior	HALL#1	1st	C	WALL	DRYWALL	YELLOW	Negative	0	mg / cm ^2
33	3	Interior	HALL#1	1st	D	WALL	DRYWALL	YELLOW	Negative	0	mg / cm ^2
34	3	Interior	HALL#1	1st	A	WALL	DRYWALL	YELLOW	Negative	0	mg / cm ^2
35	3	Interior	HALL#1	1st	B	WALL	DRYWALL	YELLOW	Negative	0	mg / cm ^2
36	3	Interior	HALL#1	1st	C	BOOKCASE	WOOD	YELLOW	Negative	0	mg / cm ^2
37	3	Interior	HALL#1	1st	C	BASEBOARD	WOOD	YELLOW	Negative	0	mg / cm ^2
38	3	Interior	KITCHEN	1st	D	BASEBOARD	WOOD	YELLOW	Negative	0	mg / cm ^2
39	3	Interior	KITCHEN	1st	D	DOOR CASING	WOOD	YELLOW	Negative	0	mg / cm ^2
40	3	Interior	KITCHEN	1st	D	DOOR	WOOD	YELLOW	Negative	0	mg / cm ^2
41	3	Interior	KITCHEN	1st	C	CABINET	WOOD	UNPAINTED	Negative	0	mg / cm ^2
42	3	Interior	KITCHEN	1st	C	CABINET LOWER	WOOD	UNPAINTED	Negative	0	mg / cm ^2



Reading No	Fire Station	Location	Room	Floor	Side	Component	Substrate	Color	Results	PbC	Units
81	3	Interior	BATHROOM#1	2nd	B	WALL	DRYWALL	BEIGE	Negative	0	mg / cm ^2
82	3	Interior	BATHROOM#1	2nd	D	WALL	DRYWALL	BEIGE	Negative	0	mg / cm ^2
83	3	Interior	BATHROOM#1	2nd	D	CEILING	DRYWALL	BEIGE	Negative	0.01	mg / cm ^2
84	3	Interior	BEDROOM#1	2nd	D	CEILING	DRYWALL	BEIGE	Negative	0	mg / cm ^2
85	3	Interior	BEDROOM#1	2nd	D	DOOR	WOOD	BEIGE	Negative	0	mg / cm ^2
86	3	Interior	BEDROOM#1	2nd	D	DOOR JAMB	WOOD	BEIGE	Negative	0	mg / cm ^2
87	3	Interior	BEDROOM#1	2nd	D	WALL	DRYWALL	BEIGE	Negative	0.01	mg / cm ^2
88	3	Interior	BEDROOM#1	2nd	A	WALL	DRYWALL	BEIGE	Negative	0	mg / cm ^2
89	3	Interior	BEDROOM#1	2nd	A	WALL	DRYWALL	BEIGE	Negative	0	mg / cm ^2
90	3	Interior	BEDROOM#1	2nd	C	WALL	DRYWALL	BEIGE	Negative	0	mg / cm ^2
91	3	Interior	BEDROOM#1	2nd	C	CEILING	DRYWALL	BEIGE	Negative	0	mg / cm ^2
5	8	Interior	Dorms	1st	C	ceiling	Drywall	White	Negative	0	mg / cm ^2
6	8	Interior	Laundry Room	1st	C	Door	Wood	White	Negative	0	mg / cm ^2
7	8	Interior	Laundry Room	1st	C	Door Jamb	Wood	White	Negative	0.4	mg / cm ^2
8	8	Interior	Laundry Room	1st	C	Ceiling	Plaster	White	Negative	0	mg / cm ^2
9	8	Interior	Laundry Room	1st	C	Cabinet Door	Wood	White	Negative	0.1	mg / cm ^2
10	8	Interior	Laundry Room	1st	C	Cabinet	Wood	White	Negative	0.07	mg / cm ^2
11	8	Interior	Utility Room	1st	B	Wall	Plaster	White	Negative	0.01	mg / cm ^2
12	8	Interior	Utility Room	1st	C	Wall	Plaster	White	Negative	0	mg / cm ^2
13	8	Interior	Utility Room	1st	A	Wall	Plaster	White	Negative	0	mg / cm ^2
14	8	Interior	Utility Room	1st	C	Shelves	Wood	White	Negative	0	mg / cm ^2
15	8	Interior	Utility Room	1st	A	Cabinet Door	Wood	Blue	Negative	0	mg / cm ^2
16	8	Interior	Kitchen	1st		Floor	Tile	Beige	Negative	0	mg / cm ^2
17	8	Interior	Kitchen	1st		Floor	Tile	Brown	Negative	0	mg / cm ^2
18	8	Interior	Kitchen	1st	B	Wall	Tile	Yellow	Positive	6.6	mg / cm ^2
19	8	Interior	Kitchen	1st	D	Cabinet Door	Wood	Varnish	Negative	0	mg / cm ^2
20	8	Interior	Kitchen	1st	D	Cabinet	Wood	Varnish	Negative	0	mg / cm ^2
21	8	Interior	Kitchen	1st	D	Cabinet Door	Wood	Varnish	Negative	0	mg / cm ^2
22	8	Interior	Kitchen	1st	D	Cabinet	Wood	Varnish	Negative	0	mg / cm ^2
23	8	Interior	Kitchen	1st	A	Vent	Metal	Red	Negative	0.23	mg / cm ^2
24	8	Interior	Bull Pen	1st	C	Wall	Plaster	White	Negative	0.06	mg / cm ^2
25	8	Interior	Bull Pen	1st	B	Window Sill	Wood	White	Negative	0	mg / cm ^2
26	8	Interior	Bull Pen	1st	A	Wall	CMU	White	Negative	0	mg / cm ^2
27	8	Interior	Bull Pen	1st		NULL	Wood	White	Null	0	mg / cm ^2
28	8	Interior	Bull Pen	1st		Ceiling tile	Wood	White	Negative	0	mg / cm ^2
2	15	Interior	KITCHEN#1	1st	A	WALL	PLASTER	WHITE	Negative	< LOD	mg / cm ^2
3	15	Interior	KITCHEN#1	1st	A	WALL	PLASTER	WHITE	Negative	< LOD	mg / cm ^2
4	15	Interior	KITCHEN#1	1st	A	WALL	PLASTER	WHITE	Negative	< LOD	mg / cm ^2



Reading No	Fire Station	Location	Room	Floor	Side	Component	Substrate	Color	Results	PbC	Units
43	3	Interior	KITCHEN	1st	C	CABINET DOOR	WOOD	UNPAINTED	Negative	0.02	mg / cm ^2
44	3	Interior	KITCHEN	1st	C	CABINET DOOR LOWER	WOOD	UNPAINTED	Negative	0	mg / cm ^2
45	3	Interior	KITCHEN	1st	A	CLOSET DOOR	WOOD	UNPAINTED	Negative	0	mg / cm ^2
46	3	Interior	KITCHEN	1st	A	CLOSET DOOR CASING	WOOD	UNPAINTED	Negative	0	mg / cm ^2
47	3	Interior	KITCHEN	1st	A	WALL	WOOD	UNPAINTED	Negative	0	mg / cm ^2
48	3	Interior	KITCHEN	1st	A	WALL	WOOD	UNPAINTED	Negative	0	mg / cm ^2
49	3	Interior	KITCHEN	1st	A	WALL	WOOD	BEIGE	Negative	0	mg / cm ^2
50	3	Interior	KITCHEN	1st	A	WALL	WOOD	BEIGE	Negative	0	mg / cm ^2
51	3	Interior	KITCHEN	1st	A	WALL	CERAMIC	BEIGE	Positive	5.3	mg / cm ^2
52	3	Interior	KITCHEN	1st	C	WALL	CERAMIC	BEIGE	Positive	4.7	mg / cm ^2
53	3	Interior	KITCHEN	1st	D	WALL	CERAMIC	BEIGE	Positive	6.3	mg / cm ^2
54	3	Interior	KITCHEN	1st	D	CEILING	CERAMIC	BEIGE	Negative	0	mg / cm ^2
55	3	Interior	KITCHEN	1st	D	SLIDER DOOR CASING	CERAMIC	BEIGE	Negative	0	mg / cm ^2
56	3	Interior	BEDROOM#2	2nd	C	DOOR	WOOD	BEIGE	Negative	0	mg / cm ^2
57	3	Interior	BEDROOM#2	2nd	C	DOOR CASING	WOOD	BEIGE	Negative	0	mg / cm ^2
58	3	Interior	BEDROOM#2	2nd	C	CABINET	WOOD	UNPAINTED	Negative	0	mg / cm ^2
59	3	Interior	BEDROOM#2	2nd	A	DOOR	WOOD	UNPAINTED	Negative	0	mg / cm ^2
60	3	Interior	BEDROOM#2	2nd	A	DOOR CASING	WOOD	UNPAINTED	Negative	0	mg / cm ^2
61	3	Interior	BEDROOM#2	2nd	A	WALL	WOOD	UNPAINTED	Null	0	mg / cm ^2
62	3	Interior	BEDROOM#2	2nd	A	WALL	WOOD	UNPAINTED	Null	0	mg / cm ^2
63	3	Interior	BEDROOM#2	2nd	A	WALL	WOOD	UNPAINTED	Negative	0	mg / cm ^2
64	3	Interior	BEDROOM#2	2nd	A	WALL	WOOD	UNPAINTED	Negative	0	mg / cm ^2
65	3	Interior	BEDROOM#2	2nd	A	WALL	WOOD	UNPAINTED	Negative	0	mg / cm ^2
66	3	Interior	BEDROOM#2	2nd	A	WALL	WOOD	UNPAINTED	Negative	0	mg / cm ^2
67	3	Interior	BEDROOM#2	2nd	A	WALL	WOOD	UNPAINTED	Negative	0	mg / cm ^2
68	3	Interior	BEDROOM#2	2nd	A	CEILING	DRYWALL	BEIGE	Negative	0	mg / cm ^2
69	3	Interior	BATHROOM#2	2nd	A	DOOR	WOOD	BEIGE	Negative	0	mg / cm ^2
70	3	Interior	BATHROOM#2	2nd	A	DOOR JAMB	WOOD	BEIGE	Negative	0	mg / cm ^2
71	3	Interior	BATHROOM#2	2nd	A	WALL	DRYWALL	BEIGE	Negative	0.03	mg / cm ^2
72	3	Interior	BATHROOM#2	2nd	D	WALL	DRYWALL	BEIGE	Negative	0.01	mg / cm ^2
73	3	Interior	BATHROOM#2	2nd	D	WALL	CERAMIC	ORANGE	Positive	6	mg / cm ^2
74	3	Interior	BATHROOM#2	2nd	D	CEILING	DRYWALL	BEIGE	Negative	0	mg / cm ^2
75	3	Interior	BATHROOM#1	2nd	A	DOOR	WOOD	BEIGE	Negative	0	mg / cm ^2
76	3	Interior	BATHROOM#1	2nd	A	DOOR JAMB	WOOD	BEIGE	Negative	0	mg / cm ^2
77	3	Interior	BATHROOM#1	2nd	C	PANEL WALL	WOOD	ORANGE	Negative	0	mg / cm ^2
78	3	Interior	BATHROOM#1	2nd	C	COUNTER	CERAMIC	ORANGE	Positive	6.5	mg / cm ^2
79	3	Interior	BATHROOM#1	2nd	A	SHOWER ENCLOSURE	CERAMIC	BEIGE	Negative	0	mg / cm ^2
80	3	Interior	BATHROOM#1	2nd	A	WALL	DRYWALL	BEIGE	Negative	0	mg / cm ^2

Fire Stations 3, 8, 15  
XRF Sample Data

Reading No	Fire Station	Location	Room	Floor	Side	Component	Substrate	Color	Results	PbC	Units
5	15	Interior	KITCHEN#1	1st	A	WALL	PLASTER	WHITE	Negative	0.25	mg / cm ^2
6	15	Interior	KITCHEN#1	1st	A	DOOR JAMB	WOOD	WHITE	Positive	2.5	mg / cm ^2
7	15	Interior	App Bay	1st	B	DOOR	WOOD	RED	Negative	< LOD	mg / cm ^2
8	15	Interior	App Bay	1st	B	WALL	PLASTER	GRAY	Negative	< LOD	mg / cm ^2
9	15	Interior	Capt Bath	1st	B	WALL	CER TILE	BLACK	Positive	< LOD	mg / cm ^2
10	15	Interior	Capt Bed	1st	B	CABINET	WOOD	WHITE	Negative	< LOD	mg / cm ^2
11	15	Interior	Capt Bed	1st	B	CABINET	WOOD	WHITE	Negative	< LOD	mg / cm ^2
12	15	Interior	Capt Bed	1st	B	CABINET	WOOD	WHITE	Negative	< LOD	mg / cm ^2
13	15	Interior	Capt Bed	1st	D	DOOR	WOOD	WHITE	Negative	< LOD	mg / cm ^2
14	15	Interior	LIVING ROOM#1	1st	C	DOOR	WOOD	WHITE	Negative	< LOD	mg / cm ^2
15	15	Interior	LIVING ROOM#1	1st	A	DOOR	WOOD	WHITE	Negative	< LOD	mg / cm ^2
16	15	Interior	BATHROOM#1	1st	A	WALL	Cer Tile	GRAY	Negative	< LOD	mg / cm ^2
17	15	Exterior	Exterior	1st	A	WALL	PLASTER	BROWN	Negative	< LOD	mg / cm ^2
18	15	Exterior	Exterior	1st	A	DOOR CASING	WOOD	RED	Positive	3.9	mg / cm ^2
19	15	Exterior	Exterior	1st	A	Curb	CONCRETE	RED	Negative	< LOD	mg / cm ^2
20	15	Exterior	Exterior	1st	B	WINDOW SILL	WOOD	BROWN	Negative	< LOD	mg / cm ^2
21	15	Exterior	Exterior	1st	B	WINDOW SILL	WOOD	BROWN	Negative	< LOD	mg / cm ^2
22	15	Exterior	Exterior	1st	B	WINDOW SILL	WOOD	BROWN	Negative	< LOD	mg / cm ^2
23	15	Exterior	Exterior	1st	B	WINDOW SILL	WOOD	BROWN	Positive	3	mg / cm ^2
24	15	Exterior	Exterior	1st	B	DOOR	WOOD	RED	Positive	1.4	mg / cm ^2
25	15	Exterior	Exterior	1st	B	FASCIA	WOOD	RED	Positive	2.8	mg / cm ^2
26	15	Interior	App Bay	1st	C	DOOR	WOOD	RED	Negative	< LOD	mg / cm ^2
27	15	Interior	App Bay	1st	C	DOOR	WOOD	RED	Negative	< LOD	mg / cm ^2
28	15	Interior	App Bay	1st	D	DOOR	WOOD	BROWN	Negative	< LOD	mg / cm ^2
29	15	Interior	KITCHEN#1	1st	C	CABINET	WOOD	BLUE	Negative	< LOD	mg / cm ^2
30	15	Interior	KITCHEN#1	1st	C	CABINET	WOOD	BLUE	Negative	< LOD	mg / cm ^2
31	15	Interior	KITCHEN#1	1st	C	CABINET	WOOD	BLUE	Negative	< LOD	mg / cm ^2

**SUPPLEMENTARY SPECIAL PROVISIONS**  
**APPENDICES**

**APPENDIX A**  
**NOTICE OF EXEMPTIONS**



**NOTICE OF EXEMPTION**

*(Check one or both)*

TO:  RECORDER/COUNTY CLERK  
P.O. BOX 1750, MS A-33  
1600 PACIFIC HWY, ROOM 260  
SAN DIEGO, CA 92101-2422

FROM: CITY OF SAN DIEGO  
PUBLIC WORKS DEPARTMENT  
525 B STREET, SUITE 750, MS 908A  
SAN DIEGO, CA 92101

OFFICE OF PLANNING AND RESEARCH  
1400 TENTH STREET, ROOM 121  
SACRAMENTO, CA 95814

PROJECT/WBS NO.: B-13187

PROJECT TITLE: Fire Station No. 3 Roof and HVAC

PROJECT LOCATION-SPECIFIC: The project is located at 725 West Kalmia Street within the Uptown Community Planning Area (Council District 3).

PROJECT LOCATION-CITY/COUNTY: San Diego/San Diego

DESCRIPTION OF NATURE, PURPOSE, AND BENEFICIARIES OF PROJECT: This project would replace the roof of Fire Station No. 3, located at 725 West Kalmia Street. In addition, the project would also replace the Heating, Ventilation and Air Conditioning (HVAC) system with associated mechanical, plumbing, and electrical upgrades. The new HVAC system would be commercial grade and factory marine-coated to withstand the marine environment at the project location. Fire Station No. 3 is located within the Little Italy Neighborhood.

NAME OF PUBLIC AGENCY APPROVING PROJECT: City of San Diego

NAME OF PERSON OR AGENCY CARRYING OUT PROJECT: City of San Diego Public Works Department,  
Contact: JUAN BALIGAD; Ph: (619) 533-5473  
525 B Street, Suite 750, San Diego, CA 92101

EXEMPT STATUS: (CHECK ONE)

- MINISTERIAL (SEC. 21080(b)(1); 15268);
- DECLARED EMERGENCY (SEC. 21080(b)(3); 15269(a));
- EMERGENCY PROJECT (SEC. 21080(b)(4); 15269 (b)(c))
- CATEGORICAL EXEMPTION: 15301(D) [EXISTING FACILITIES]
- STATUTORY EXEMPTIONS:

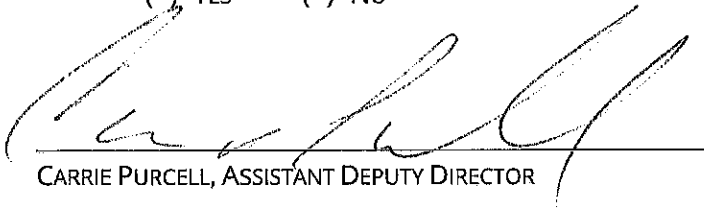
REASONS WHY PROJECT IS EXEMPT: The City of San Diego conducted an environmental review which determined that the project meets the categorical exemption criteria set forth in CEQA State Guidelines, Section 15301(D) [Existing Facilities] which allows for restoration or rehabilitation of deteriorated or damaged structures, facilities, or mechanical equipment to meet current standards of public health and safety. This project does not trigger any of the exceptions to categorical exemptions found in State CEQA Guideline 15300.2.

LEAD AGENCY CONTACT PERSON: CARRIE PURCELL

TELEPHONE: (619) 533-5124

IF FILED BY APPLICANT:

1. ATTACH CERTIFIED DOCUMENT OF EXEMPTION FINDING.
2. HAS A NOTICE OF EXEMPTION BEEN FILED BY THE PUBLIC AGENCY APPROVING THE PROJECT?  
 YES       NO



CARRIE PURCELL, ASSISTANT DEPUTY DIRECTOR

MARCH 1, 2017  
DATE

CHECK ONE:

- SIGNED BY LEAD AGENCY  
 SIGNED BY APPLICANT

DATE RECEIVED FOR FILING AT OPR:

**NOTICE OF EXEMPTION**

(Check one or both)

TO:  RECORDER/COUNTY CLERK  
P.O. Box 1750, MS A-33  
1600 PACIFIC HWY, ROOM 260  
SAN DIEGO, CA 92101-2422

FROM: CITY OF SAN DIEGO  
PUBLIC WORKS DEPARTMENT  
525 B STREET, SUITE 750, MS 908A  
SAN DIEGO, CA 92101

OFFICE OF PLANNING AND RESEARCH  
1400 TENTH STREET, ROOM 121  
SACRAMENTO, CA 95814

PROJECT/WBS NO.: S-10029

PROJECT TITLE: Fire Station No. 8 Expansion

PROJECT LOCATION-SPECIFIC: The project is located at 3974 Goldfinch Street within the Uptown community planning area (Council District 3).

PROJECT LOCATION-CITY/COUNTY: San Diego/San Diego

DESCRIPTION OF NATURE, PURPOSE, AND BENEFICIARIES OF PROJECT: The project proposes to expand the existing structure (Fire Station No. 8) to provide space for a new kitchen, training room, watch room, ADA compliant restrooms, and other improvements to the electrical, mechanical, communications, and HVAC systems to better meet the current needs for the station. The project is consistent with the underlying zone, CC-3-8, and will not impact historic resources..

NAME OF PUBLIC AGENCY APPROVING PROJECT: City of San Diego

NAME OF PERSON OR AGENCY CARRYING OUT PROJECT: City of San Diego Public Works Department,  
Contact: Juan Baligad; Ph: (619) 533-5473  
525 B Street, Suite 750, San Diego, CA 92101

EXEMPT STATUS: (CHECK ONE)

- MINISTERIAL (SEC. 21080(b)(1); 15268);
- DECLARED EMERGENCY (SEC. 21080(b)(3); 15269(a));
- EMERGENCY PROJECT (SEC. 21080(b)(4); 15269 (b)(c))
- CATEGORICAL EXEMPTION: 15301(E) [EXISTING FACILITIES]
- STATUTORY EXEMPTIONS:

REASONS WHY PROJECT IS EXEMPT: The City of San Diego conducted an environmental review which determined that the project meets the categorical exemption criteria set forth in CEQA State Guidelines, Section 15301(E) [Existing Facilities] which allows for additions to existing structures provided that the addition will not result in an increase of more than 10,000 square feet if the area in which the project is located is not environmentally sensitive. This project does not trigger any of the exceptions to categorical exemptions found in State CEQA Guideline 15300.2.

LEAD AGENCY CONTACT PERSON: Carrie Purcell

TELEPHONE: (619) 533-5124

IF FILED BY APPLICANT:

1. ATTACH CERTIFIED DOCUMENT OF EXEMPTION FINDING.
2. HAS A NOTICE OF EXEMPTION BEEN FILED BY THE PUBLIC AGENCY APPROVING THE PROJECT?  
 YES       NO

  
\_\_\_\_\_  
CARRIE PURCELL, ASSISTANT DEPUTY DIRECTOR

3/27/17  
\_\_\_\_\_  
DATE

CHECK ONE:

- SIGNED BY LEAD AGENCY  
 SIGNED BY APPLICANT

DATE RECEIVED FOR FILING AT OPR:



**NOTICE OF EXEMPTION**

(Check one or both)

TO:  RECORDER/COUNTY CLERK  
P.O. BOX 1750, MS A-33  
1600 PACIFIC HWY, ROOM 260  
SAN DIEGO, CA 92101-2422

FROM: CITY OF SAN DIEGO  
PUBLIC WORKS DEPARTMENT  
525 B STREET, SUITE 750, MS 908A  
SAN DIEGO, CA 92101

OFFICE OF PLANNING AND RESEARCH  
1400 TENTH STREET, ROOM 121  
SACRAMENTO, CA 95814

PROJECT/WBS NO.: S-13001

PROJECT TITLE: Fire Station No. 15 Improvements

PROJECT LOCATION-SPECIFIC: The project is located at 4711 Voltaire Street within the Ocean Beach community planning area (Council District 2).

PROJECT LOCATION-CITY/COUNTY: San Diego/San Diego

DESCRIPTION OF NATURE, PURPOSE, AND BENEFICIARIES OF PROJECT: The project proposes a 2,500 sq. ft. expansion of the existing structure at Fire Station No. 15 to provide space for a new kitchen, training room, dining room, ADA upgrades and other improvements to the electrical, mechanical, communications, and HVAC systems to better meet the current needs for the station. The project additions are consistent with the underlying zone, CC-4-2, and will not impact historic resources.

NAME OF PUBLIC AGENCY APPROVING PROJECT: City of San Diego

NAME OF PERSON OR AGENCY CARRYING OUT PROJECT: City of San Diego Public Works Department  
Contact: Juan Baligad; Ph: (619) 533-5473  
525 B Street, Suite 750, San Diego, CA 92101

EXEMPT STATUS: (CHECK ONE)

- MINISTERIAL (SEC. 21080(b)(1); 15268);
- DECLARED EMERGENCY (SEC. 21080(b)(3); 15269(a));
- EMERGENCY PROJECT (SEC. 21080(b)(4); 15269 (b)(c))
- CATEGORICAL EXEMPTION: 15301(E) [EXISTING FACILITIES]
- STATUTORY EXEMPTIONS:


REASONS WHY PROJECT IS EXEMPT: The City of San Diego conducted an environmental review which determined that the project meets the categorical exemption criteria set forth in CEQA State Guidelines, Section 15301(E) [Existing Facilities] which allows for additions to the existing structures provided that the addition will not result in an increase of more than 2,500 square feet and. This project does not trigger any of the exceptions to categorical exemptions found in State CEQA Guideline 15300.2.

LEAD AGENCY CONTACT PERSON: Carrie Purcell

TELEPHONE: (619) 533-5124

IF FILED BY APPLICANT:

1. ATTACH CERTIFIED DOCUMENT OF EXEMPTION FINDING.
2. HAS A NOTICE OF EXEMPTION BEEN FILED BY THE PUBLIC AGENCY APPROVING THE PROJECT?  
 YES       NO

  
\_\_\_\_\_  
CARRIE PURCELL, ASSISTANT DEPUTY DIRECTOR

3/27/17  
\_\_\_\_\_  
DATE

CHECK ONE:

- SIGNED BY LEAD AGENCY  
 SIGNED BY APPLICANT

DATE RECEIVED FOR FILING AT OPR:

**APPENDIX B**  
**FIRE HYDRANT METER PROGRAM**

<b>CITY OF SAN DIEGO CALIFORNIA DEPARTMENT INSTRUCTIONS</b>	<b>NUMBER DI 55.27</b>	<b>DEPARTMENT Water Department</b>
<b>SUBJECT  FIRE HYDRANT METER PROGRAM (FORMERLY: CONSTRUCTION METER PROGRAM)</b>	<b>PAGE 1 OF 10</b>	<b>EFFECTIVE DATE  October 15, 2002</b>
	<b>SUPERSEDES DI 55.27</b>	<b>DATED April 21, 2000</b>

1. **PURPOSE**

1.1 To establish a Departmental policy and procedure for issuance, proper usage and charges for fire hydrant meters.

2. **AUTHORITY**

2.1 All authorities and references shall be current versions and revisions.

2.2 San Diego Municipal Code (NC) Chapter VI, Article 7, Sections 67.14 and 67.15

2.3 Code of Federal Regulations, Safe Drinking Water Act of 1986

2.4 California Code of Regulations, Titles 17 and 22

2.5 California State Penal Code, Section 498B.0

2.6 State of California Water Code, Section 110, 500-6, and 520-23

2.7 Water Department Director

**Reference**

2.8 State of California Guidance Manual for Cross Connection Programs

2.9 American Water Works Association Manual M-14, Recommended Practice for Backflow Prevention

2.10 American Water Works Association Standards for Water Meters

2.11 U.S.C. Foundation for Cross Connection Control and Hydraulic Research Manual

3. **DEFINITIONS**

3.1 **Fire Hydrant Meter:** A portable water meter which is connected to a fire hydrant for the purpose of temporary use. (These meters are sometimes referred to as Construction Meters.)

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- 3.2 **Temporary Water Use:** Water provided to the customer for no longer than twelve (12) months.
- 3.3 **Backflow Preventor:** A Reduced Pressure Principal Assembly connected to the outlet side of a Fire Hydrant Meter.

4. **POLICY**

- 4.1 The Water Department shall collect a deposit from every customer requiring a fire hydrant meter and appurtenances prior to providing the meter and appurtenances (see Section 7.1 regarding the Fees and Deposit Schedule). The deposit is refundable upon the termination of use and return of equipment and appurtenances in good working condition.
- 4.2 Fire hydrant meters will have a 2 ½" swivel connection between the meter and fire hydrant. The meter shall not be connected to the 4" port on the hydrant. All Fire Hydrant Meters issued shall have a Reduced Pressure Principle Assembly (RP) as part of the installation. Spanner wrenches are the only tool allowed to turn on water at the fire hydrant.
- 4.3 The use of private hydrant meters on City hydrants is prohibited, with exceptions as noted below. All private fire hydrant meters are to be phased out of the City of San Diego. All customers who wish to continue to use their own fire hydrant meters must adhere to the following conditions:
  - a. Meters shall meet all City specifications and American Water Works Association (AWWA) standards.
  - b. Customers currently using private fire hydrant meters in the City of San Diego water system will be allowed to continue using the meter under the following conditions:
    - 1. The customer must submit a current certificate of accuracy and calibration results for private meters and private backflows annually to the City of San Diego, Water Department, Meter Shop.

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2. The meter must be properly identifiable with a clearly labeled serial number on the body of the fire hydrant meter. The serial number shall be plainly stamped on the register lid and the main casing. Serial numbers shall be visible from the top of the meter casing and the numbers shall be stamped on the top of the inlet casing flange.
3. All meters shall be locked to the fire hydrant by the Water Department, Meter Section (see Section 4.7).
4. All meters shall be read by the Water Department, Meter Section (see Section 4.7).
5. All meters shall be relocated by the Water Department, Meter Section (see Section 4.7).
6. These meters shall be tested on the anniversary of the original test date and proof of testing will be submitted to the Water Department, Meter Shop, on a yearly basis. If not tested, the meter will not be allowed for use in the City of San Diego.
7. All private fire hydrant meters shall have backflow devices attached when installed.
8. The customer must maintain and repair their own private meters and private backflows.
9. The customer must provide current test and calibration results to the Water Department, Meter Shop after any repairs.
10. When private meters are damaged beyond repair, these private meters will be replaced by City owned fire hydrant meters.

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11. When a private meter malfunctions, the customer will be notified and the meter will be removed by the City and returned to the customer for repairs. Testing and calibration results shall be given to the City prior to any re-installation.
  12. The register shall be hermetically sealed straight reading and shall be readable from the inlet side. Registration shall be in hundred cubic feet.
  13. The outlet shall have a 2 ½ “National Standards Tested (NST) fire hydrant male coupling.
  14. Private fire hydrant meters shall not be transferable from one contracting company to another (i.e. if a company goes out of business or is bought out by another company).
- 4.4 All fire hydrant meters and appurtenances shall be installed, relocated and removed by the City of San Diego, Water Department. All City owned fire hydrant meters and appurtenances shall be maintained by the City of San Diego, Water Department, Meter Services.
- 4.5 If any fire hydrant meter is used in violation of this Department Instruction, the violation will be reported to the Code Compliance Section for investigation and appropriate action. Any customer using a fire hydrant meter in violation of the requirements set forth above is subject to fines or penalties pursuant to the Municipal Code, Section 67.15 and Section 67.37.
- 4.6 **Conditions and Processes for Issuance of a Fire Hydrant Meter**
- Process for Issuance
- a. Fire hydrant meters shall only be used for the following purposes:
    1. Temporary irrigation purposes not to exceed one year.

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2. Construction and maintenance related activities (see Tab 2).
  - b. No customer inside or outside the boundaries of the City of San Diego Water Department shall resell any portion of the water delivered through a fire hydrant by the City of San Diego Water Department.
  - c. The City of San Diego allows for the issuance of a temporary fire hydrant meter for a period not to exceed 12 months (365 days). An extension can only be granted in writing from the Water Department Director for up to 90 additional days. A written request for an extension by the consumer must be submitted at least 30 days prior to the 12 month period ending. No extension shall be granted to any customer with a delinquent account with the Water Department. No further extensions shall be granted.
  - d. Any customer requesting the issuance of a fire hydrant meter shall file an application with the Meter Section. The customer must complete a "Fire Hydrant Meter Application" (Tab 1) which includes the name of the company, the party responsible for payment, Social Security number and/or California ID, requested location of the meter (a detailed map signifying an exact location), local contact person, local phone number, a contractor's license (or a business license), description of specific water use, duration of use at the site and full name and address of the person responsible for payment.
  - e. At the time of the application the customer will pay their fees according to the schedule set forth in the Rate Book of Fees and Charges, located in the City Clerk's Office. All fees must be paid by check, money order or cashiers check, made payable to the City Treasurer. Cash will not be accepted.
  - f. No fire hydrant meters shall be furnished or relocated for any customer with a delinquent account with the Water Department.
  - g. After the fees have been paid and an account has been created, the



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meter shall be installed within 48 hours (by the second business day). For an additional fee, at overtime rates, meters can be installed within 24 hours (within one business day).

#### 4.7 Relocation of Existing Fire Hydrant Meters

- a. The customer shall call the Fire Hydrant Meter Hotline (herein referred to as “Hotline”), a minimum of 24 hours in advance, to request the relocation of a meter. A fee will be charged to the existing account, which must be current before a work order is generated for the meter’s relocation.
- b. The customer will supply in writing the address where the meter is to be relocated (map page, cross street, etc). The customer must update the original Fire Hydrant Meter Application with any changes as it applies to the new location.
- c. Fire hydrant meters shall be read on a monthly basis. While fire hydrant meters and backflow devices are in service, commodity, base fee and damage charges, if applicable, will be billed to the customer on a monthly basis. If the account becomes delinquent, the meter will be removed.

#### 4.8 Disconnection of Fire Hydrant Meter

- a. After ten (10) months a “Notice of Discontinuation of Service” (Tab 3) will be issued to the site and the address of record to notify the customer of the date of discontinuance of service. An extension can only be granted in writing from the Water Department Director for up to 90 additional days (as stated in Section 4.6C) and a copy of the extension shall be forwarded to the Meter Shop Supervisor. If an extension has not been approved, the meter will be removed after twelve (12) months of use.
- b. Upon completion of the project the customer will notify the Meter Services office via the Hotline to request the removal of the fire hydrant meter and appurtenances. A work order will be generated

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for removal of the meter.

- c. Meter Section staff will remove the meter and backflow prevention assembly and return it to the Meter Shop. Once returned to the Meter Shop the meter and backflow will be tested for accuracy and functionality.
- d. Meter Section Staff will contact and notify Customer Services of the final read and any charges resulting from damages to the meter and backflow or its appurtenance. These charges will be added on the customer's final bill and will be sent to the address of record. Any customer who has an outstanding balance will not receive additional meters.
- e. Outstanding balances due may be deducted from deposits and any balances refunded to the customer. Any outstanding balances will be turned over to the City Treasurer for collection. Outstanding balances may also be transferred to any other existing accounts.

5. **EXCEPTIONS**

- 5.1 Any request for exceptions to this policy shall be presented, in writing, to the Customer Support Deputy Director, or his/her designee for consideration.

6. **MOBILE METER**

- 6.1 Mobile meters will be allowed on a case by case basis. All mobile meters will be protected by an approved backflow assembly and the minimum requirement will be a Reduced Pressure Principal Assembly. The two types of Mobile Meters are vehicle mounted and floating meters. Each style of meters has separate guidelines that shall be followed for the customer to retain service and are described below:

- a) **Vehicle Mounted Meters:** Customer applies for and receives a City owned Fire Hydrant Meter from the Meter Shop. The customer mounts the meter on the vehicle and brings it to the Meter Shop for

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inspection. After installation is approved by the Meter Shop the vehicle and meter shall be brought to the Meter Shop on a monthly basis for meter reading and on a quarterly basis for testing of the backflow assembly. Meters mounted at the owner's expense shall have the one year contract expiration waived and shall have meter or backflow changed if either fails.

b) **Floating Meters:** Floating Meters are meters that are not mounted to a vehicle. **(Note: All floating meters shall have an approved backflow assembly attached.)** The customer shall submit an application and a letter explaining the need for a floating meter to the Meter Shop. The Fire Hydrant Meter Administrator, after a thorough review of the needs of the customer, (i.e. number of jobsites per day, City contract work, lack of mounting area on work vehicle, etc.), may issue a floating meter. At the time of issue, it will be necessary for the customer to complete and sign the "Floating Fire Hydrant Meter Agreement" which states the following:

- 1) The meter will be brought to the Meter Shop at 2797 Caminito Chollas, San Diego on the third week of each month for the monthly read by Meter Shop personnel.
- 2) Every other month the meter will be read and the backflow will be tested. This date will be determined by the start date of the agreement.

If any of the conditions stated above are not met the Meter Shop has the right to cancel the contract for floating meter use and close the account associated with the meter. The Meter Shop will also exercise the right to refuse the issuance of another floating meter to the company in question.

Any Fire Hydrant Meter using reclaimed water shall not be allowed use again with any potable water supply. The customer shall incur the cost of replacing the meter and backflow device in this instance.

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7. **FEE AND DEPOSIT SCHEDULES**

7.1 **Fees and Deposit Schedules:** The fees and deposits, as listed in the Rate Book of Fees and Charges, on file with the Office of the City Clerk, are based on actual reimbursement of costs of services performed, equipment and materials. These deposits and fees will be amended, as needed, based on actual costs. Deposits, will be refunded at the end of the use of the fire hydrant meter, upon return of equipment in good working condition and all outstanding balances on account are paid. Deposits can also be used to cover outstanding balances.

All fees for equipment, installation, testing, relocation and other costs related to this program are subject to change without prior notification. The Mayor and Council will be notified of any future changes.

8. **UNAUTHORIZED USE OF WATER FROM A HYDRANT**

8.1 Use of water from any fire hydrant without a properly issued and installed fire hydrant meter is theft of City property. Customers who use water for unauthorized purposes or without a City of San Diego issued meter will be prosecuted.

8.2 If any unauthorized connection, disconnection or relocation of a fire hydrant meter, or other connection device is made by anyone other than authorized Water Department personnel, the person making the connection will be prosecuted for a violation of San Diego Municipal Code, Section 67.15. In the case of a second offense, the customer's fire hydrant meter shall be confiscated and/or the deposit will be forfeited.

8.3 Unauthorized water use shall be billed to the responsible party. Water use charges shall be based on meter readings, or estimates when meter readings are not available.

8.4 In case of unauthorized water use, the customer shall be billed for all applicable charges as if proper authorization for the water use had been obtained, including but not limited to bi-monthly service charges, installation charges and removal charges.

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- 8.5 If damage occurs to Water Department property (i.e. fire hydrant meter, backflow, various appurtenances), the cost of repairs or replacements will be charged to the customer of record (applicant).

**Water Department Director**

- Tabs: 1. Fire Hydrant Meter Application  
2. Construction & Maintenance Related Activities With No Return To Sewer  
3. Notice of Discontinuation of Service

**APPENDIX**

**Administering Division:** Customer Support Division

**Subject Index:** Construction Meters  
Fire Hydrant  
Fire Hydrant Meter Program  
Meters, Floating or Vehicle Mounted  
Mobile Meter  
Program, Fire Hydrant Meter

**Distribution:** DI Manual Holders



# Application for Fire Hydrant Meter (EXHIBIT A)

(For Office Use Only)

NS REQ	FAC#
DATE	BY

METER SHOP (619) 527-7449

## Meter Information

Application Date	Requested Install Date:
------------------	-------------------------

Fire Hydrant Location: (Attach Detailed Map//Thomas Bros. Map Location or Construction drawing.) <u>Zip:</u>	T.B.	G.B. (CITY USE)
Specific Use of Water:		
Any Return to Sewer or Storm Drain, if so, explain:		
Estimated Duration of Meter Use: <input type="text"/>	<input type="checkbox"/>	Check Box if Reclaimed Water

## Company Information

Company Name:			
Mailing Address:			
City:	State:	Zip:	Phone: ( )
*Business license#		*Contractor license#	
A Copy of the Contractor's license OR Business License is required at the time of meter issuance.			
Name and Title of Billing Agent: <small>(PERSON IN ACCOUNTS PAYABLE)</small>			Phone: ( )
Site Contact Name and Title:			Phone: ( )
Responsible Party Name:			Title:
Cal ID#			Phone: ( )
Signature:		Date:	
<small>Guarantees Payment of all Charges Resulting from the use of this Meter. Insures that employees of this Organization understand the proper use of Fire Hydrant Meter</small>			

<b>Fire Hydrant Meter Removal Request</b>	Requested Removal Date:
Provide Current Meter Location if Different from Above:	
Signature:	Title:      Date:
Phone: ( )	Pager: ( )

<input type="checkbox"/> City Meter	<input type="checkbox"/> Private Meter	
Contract Acct #:	Deposit Amount: <b>\$ 936.00</b>	Fees Amount: <b>\$ 62.00</b>
Meter Serial #	Meter Size: <b>05</b>	Meter Make and Style: <b>6-7</b>
Backflow #	Backflow Size:	Backflow Make and Style:
Name:	Signature:	Date:

**WATER USES WITHOUT ANTICIPATED CHARGES FOR RETURN TO SEWER**

Auto Detailing  
Backfilling  
Combination Cleaners (Vactors)  
Compaction  
Concrete Cutters  
Construction Trailers  
Cross Connection Testing  
Dust Control  
Flushing Water Mains  
Hydro Blasting  
Hydro Seeing  
Irrigation (for establishing irrigation only; not continuing irrigation)  
Mixing Concrete  
Mobile Car Washing  
Special Events  
Street Sweeping  
Water Tanks  
Water Trucks  
Window Washing

**Note:**

1. If there is any return to sewer or storm drain, then sewer and/or storm drain fees will be charges.

Date

Name of Responsible Party  
Company Name and Address  
Account Number: \_\_\_\_\_

Subject:           Discontinuation of Fire Hydrant Meter Service

Dear Water Department Customer:

The authorization for use of Fire Hydrant Meter # \_\_\_\_\_, located at *(Meter Location Address)* ends in 60 days and will be removed on or after *(Date Authorization Expires)*. Extension requests for an additional 90 days must be submitted in writing for consideration 30 days prior to the discontinuation date. If you require an extension, please contact the Water Department, or mail your request for an extension to:

City of San Diego  
Water Department  
Attention: Meter Services  
2797 Caminito Chollas  
San Diego, CA 92105-5097

Should you have any questions regarding this matter, please call the Fire Hydrant Hotline at (619) \_\_\_\_\_ - \_\_\_\_\_.

Sincerely,

Water Department



**APPENDIX C**

**MATERIALS TYPICALLY ACCEPTED BY CERTIFICATE OF COMPLIANCE**

## Materials Typically Accepted by Certificate of Compliance

1. Soil amendment
2. Fiber mulch
3. PVC or PE pipe up to 16 inch diameter
4. Stabilizing emulsion
5. Lime
6. Preformed elastomeric joint seal
7. Plain and fabric reinforced elastomeric bearing pads
8. Steel reinforced elastomeric bearing pads
9. Waterstops (Special Condition)
10. Epoxy coated bar reinforcement
11. Plain and reinforcing steel
12. Structural steel
13. Structural timber and lumber
14. Treated timber and lumber
15. Lumber and timber
16. Aluminum pipe and aluminum pipe arch
17. Corrugated steel pipe and corrugated steel pipe arch
18. Structural metal plate pipe arches and pipe arches
19. Perforated steel pipe
20. Aluminum underdrain pipe
21. Aluminum or steel entrance tapers, pipe downdrains, reducers, coupling bands and slip joints
22. Metal target plates
23. Paint (traffic striping)
24. Conductors
25. Painting of electrical equipment
26. Electrical components
27. Engineering fabric
28. Portland Cement
29. PCC admixtures
30. Minor concrete, asphalt
31. Asphalt (oil)
32. Liquid asphalt emulsion
33. Epoxy

**APPENDIX D**

**SAMPLE CITY INVOICE WITH SPEND CURVE**

City of San Diego, CM&FS Div., 9753 Chesapeake Drive, SD CA 92123

**Project Name:**

Work Order No or Job Order No.

City Purchase Order No.

Resident Engineer (RE):

RE Phone#: Fax#:

**Contractor's Name:**

Contractor's Address:

Contractor's Phone #:

Contractor's fax #:

Contact Name:

**Invoice No.**

**Invoice Date:**

Billing Period: ( To )

Item #	Item Description	Contract Authorization				Previous Totals To Date		This Estimate		Totals to Date	
		Unit	Price	Qty	Extension	%/QTY	Amount	% / QTY	Amount	% / QTY	Amount
1					\$ -		\$ -		\$ -	0.00%	\$ -
2					\$ -		\$ -		\$ -	0.00%	\$ -
3					\$ -		\$ -		\$ -	0.00%	\$ -
4					\$ -		\$ -		\$ -	0.00%	\$ -
5					\$ -		\$ -		\$ -	0.00%	\$ -
6					\$ -		\$ -		\$ -	0.00%	\$ -
7					\$ -		\$ -		\$ -	0.00%	\$ -
8					\$ -		\$ -		\$ -	0.00%	\$ -
5					\$ -		\$ -		\$ -	0.00%	\$ -
6					\$ -		\$ -		\$ -	0.00%	\$ -
7					\$ -		\$ -		\$ -	0.00%	\$ -
8					\$ -		\$ -		\$ -	0.00%	\$ -
9					\$ -		\$ -		\$ -	0.00%	\$ -
10					\$ -		\$ -		\$ -	0.00%	\$ -
11					\$ -		\$ -		\$ -	0.00%	\$ -
12					\$ -		\$ -		\$ -	0.00%	\$ -
13					\$ -		\$ -		\$ -	0.00%	\$ -
14					\$ -		\$ -		\$ -	0.00%	\$ -
15					\$ -		\$ -		\$ -	0.00%	\$ -
16					\$ -		\$ -		\$ -	0.00%	\$ -
17	<b>Field Orders</b>				\$ -		\$ -		\$ -	0.00%	\$ -
					\$ -		\$ -		\$ -	0.00%	\$ -
	<b>CHANGE ORDER No.</b>				\$ -		\$ -		\$ -	0.00%	\$ -
					\$ -		\$ -		\$ -	0.00%	\$ -
	Total Authorized Amount (including approved Change Order)				\$ -		\$ -		\$ -	<b>Total Billed</b>	\$ -

**SUMMARY**

A. Original Contract Amount	\$ -
B. Approved Change Order #00 Thru #00	\$ -
C. Total Authorized Amount (A+B)	\$ -
D. Total Billed to Date	\$ -
E. Less Total Retention (5% of D )	\$ -
F. Less Total Previous Payments	\$ -
<b>G. Payment Due Less Retention</b>	<b>\$0.00</b>
H. Remaining Authorized Amount	\$0.00

I certify that the materials  
have been received by me in  
the quality and quantity specified

---

Resident Engineer

---

Construction Engineer

**Retention and/or Escrow Payment Schedule**

Total Retention Required as of this billing (Item E)	\$0.00
Previous Retention Withheld in PO or in Escrow	\$0.00
<b>Add'l Amt to Withhold in PO/Transfer in Escrow:</b>	<b>\$0.00</b>
<b>Amt to Release to Contractor from PO/Escrow:</b>	

Contractor Signature and Date: \_\_\_\_\_

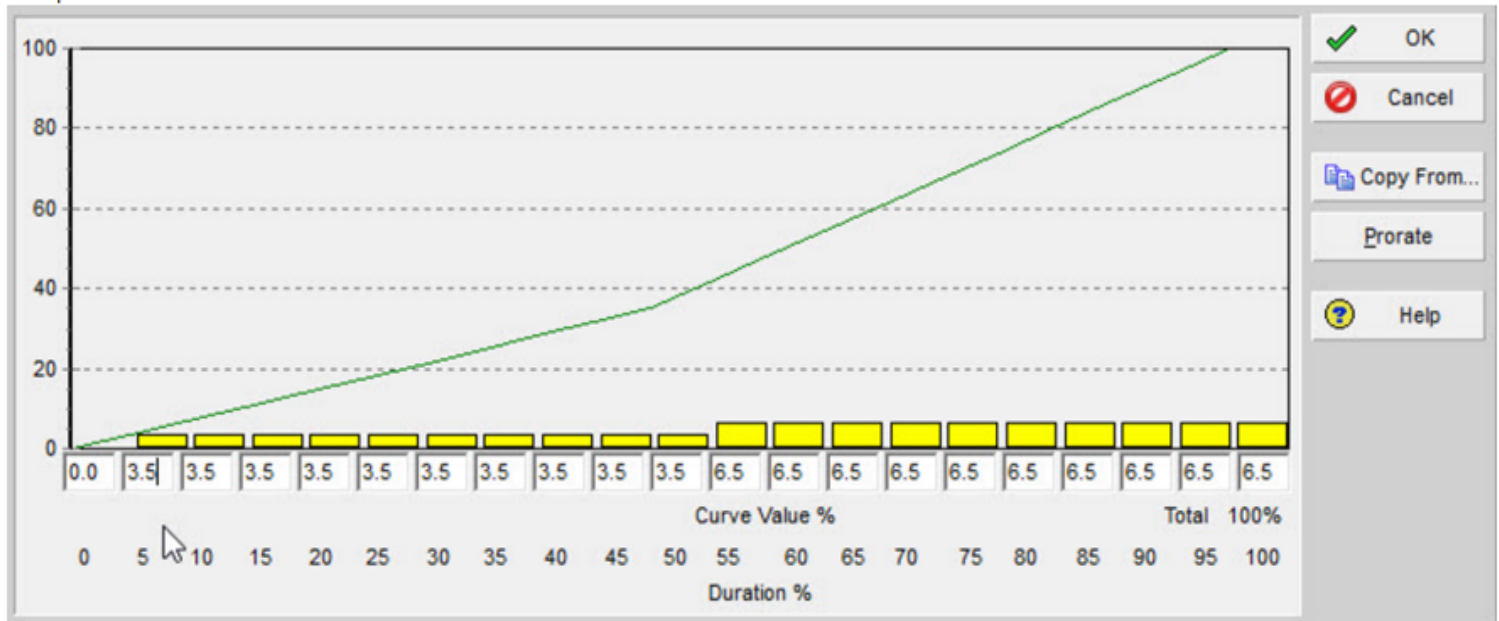
## Sample Project Spend Curve

Sample Date Entries Required

Incremental Curve Value  
Duration % Increment

0.0%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%
0%	5%	10%	15%	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%

Sample Screenshot from Primavera P6



**APPENDIX E**  
**LOCATION MAPS**

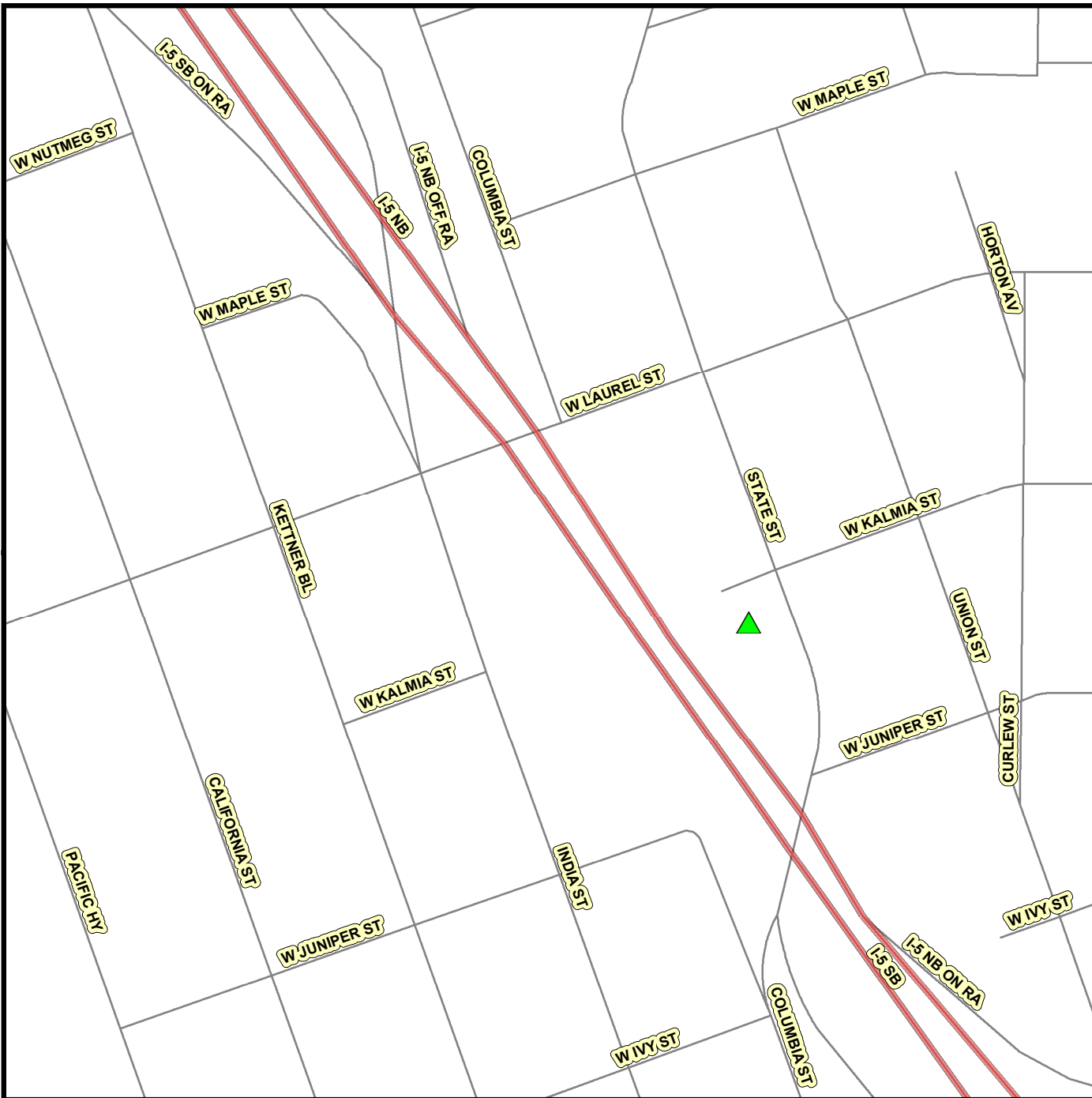
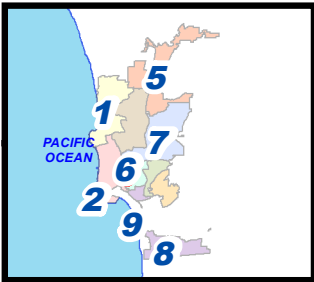
### FIRE STATION NO. 3

SENIOR ENGINEER  
Jason Grani  
619-533-7525

PROJECT MANAGER  
Michael Maria  
619-533-4688

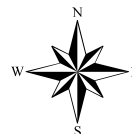
PROJECT ENGINEER  
N/A

FOR QUESTIONS ABOUT THIS PROJECT  
Call: 619-533-4207  
Email: [engineering@sandiego.gov](mailto:engineering@sandiego.gov)



### Legend

 FS#3



COMMUNITY NAME: Uptown

COUNCIL DISTRICT: 3

SAP ID: B-13187

Date: 31 July 2017



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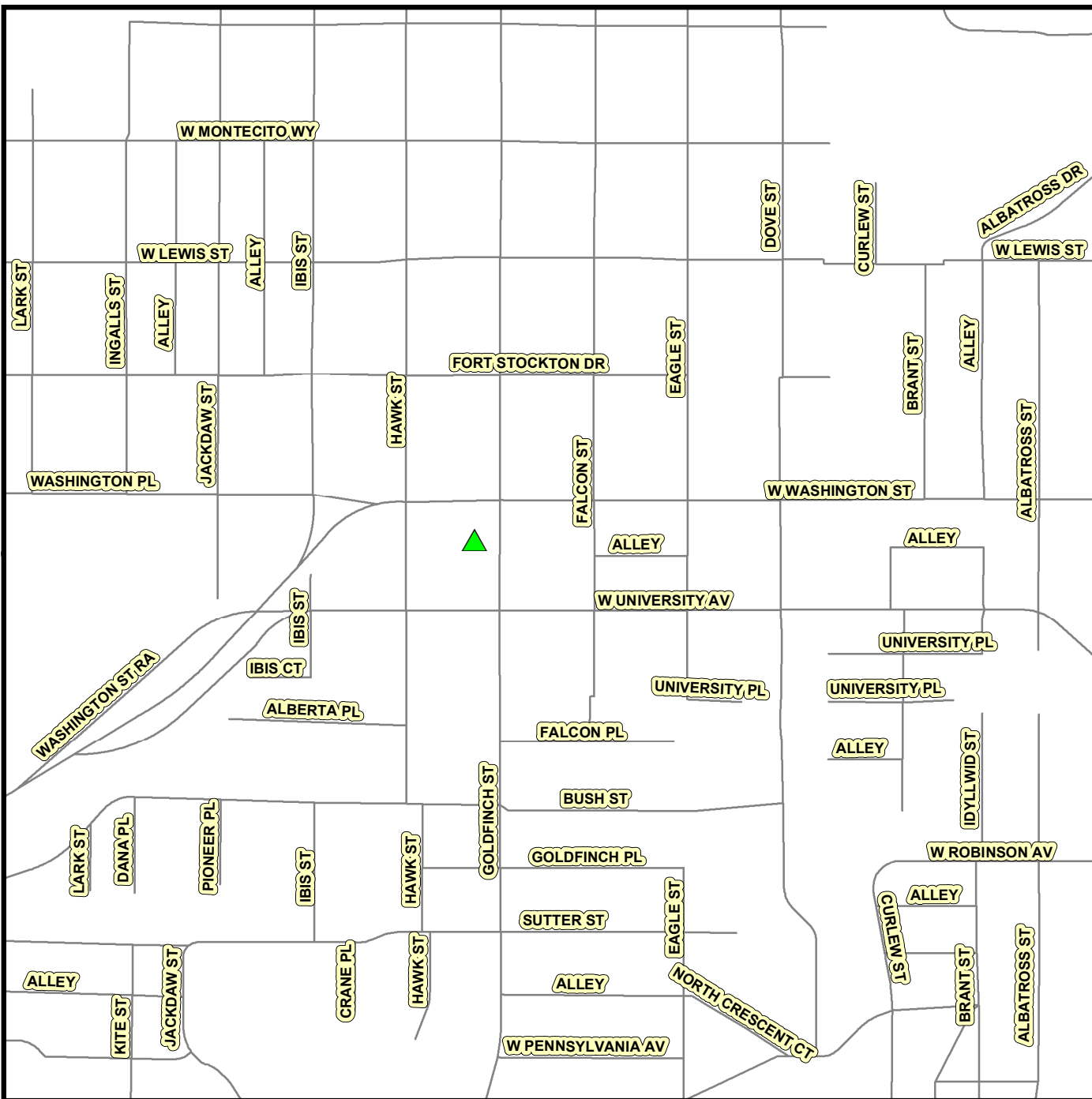
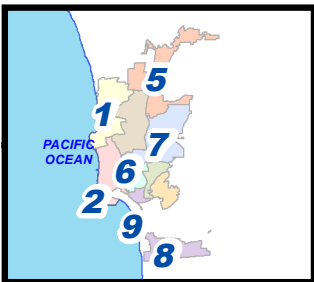
### Fire Station No. 8

SENIOR ENGINEER  
Jason Grani  
619-533-7525

PROJECT MANAGER  
Michael Maria  
619-533-4688

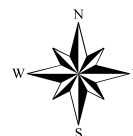
PROJECT ENGINEER  
N/A

FOR QUESTIONS ABOUT THIS PROJECT  
Call: 619-533-4207  
Email: [engineering@sandiego.gov](mailto:engineering@sandiego.gov)



### Legend

 FS#8



COMMUNITY NAME: Uptown

COUNCIL DISTRICT: 3

SAP ID: S-10029

Date: 31 July 2017



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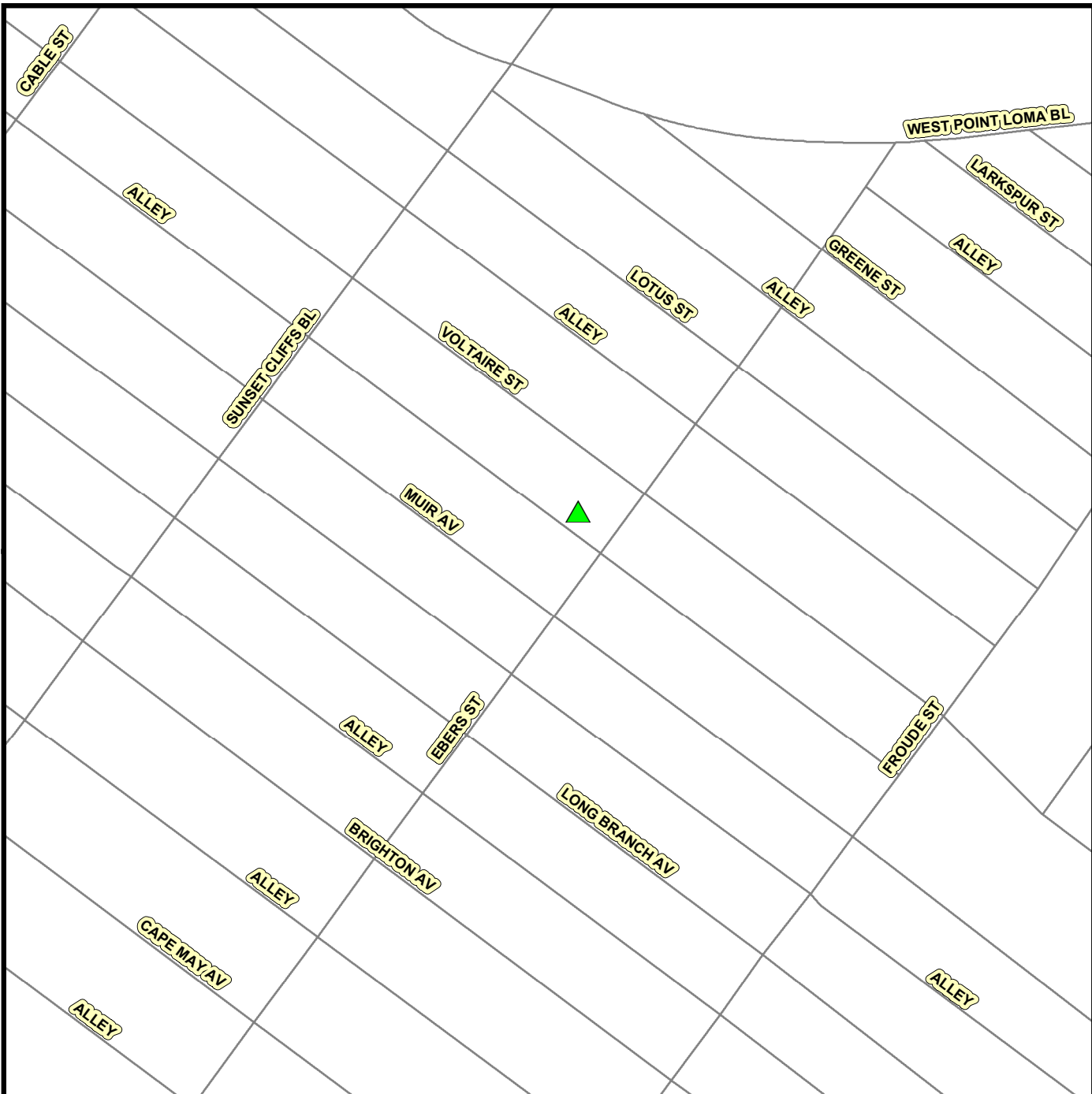
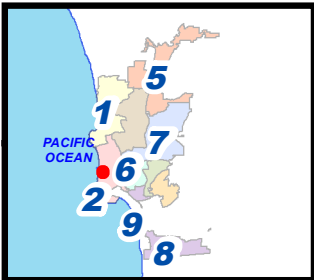
### Fire Station No. 15

SENIOR ENGINEER  
Jason Grani  
619-533-7525

PROJECT MANAGER  
Michael Maria  
619-533-4688

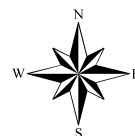
PROJECT ENGINEER  
N/A

FOR QUESTIONS ABOUT THIS PROJECT  
Call: 619-533-4207  
Email: [engineering@sandiego.gov](mailto:engineering@sandiego.gov)



### Legend

 FS#15



COMMUNITY NAME: Ocean Beach

COUNCIL DISTRICT: 2

SAP ID: S-13011

Date: 31 July 2017



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**APPENDIX F**  
**HAZARDOUS LABEL AND FORMS**

# HAZARDOUS WASTE

STATE AND FEDERAL LAW PROHIBITS IMPROPER DISPOSAL  
IF FOUND, CONTACT THE NEAREST POLICE, OR PUBLIC SAFETY  
AUTHORITY, OR THE U.S. ENVIRONMENTAL PROTECTION AGENCY  
OR THE CALIFORNIA DEPARTMENT OF HEALTH SERVICES

GENERATOR NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_ 24 HR. PHONE ( ) \_\_\_\_\_

CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_

EPA ID NO. \_\_\_\_\_ MANIFEST DOCUMENT NO. \_\_\_\_\_

EPA WASTE NO. \_\_\_\_\_ CA WASTE NO. \_\_\_\_\_ ACCUMULATION START DATE \_\_\_\_\_ / \_\_\_\_ / \_\_\_\_

CONTENTS, COMPOSITION \_\_\_\_\_

PROPER DOT SHIPPING NAME \_\_\_\_\_

TECHNICAL NAME (S) \_\_\_\_\_

UN/NA NO. WITH PREFIX \_\_\_\_\_

PHYSICAL STATE | HAZARDOUS PROPERTIES  FLAMMABLE  TOXIC  
 SOLID  LIQUID |  CORROSIVE  REACTIVE  OTHER \_\_\_\_\_

**HANDLE WITH CARE!**  
CONTAINS HAZARDOUS OR TOXIC WASTES

# INCIDENT/RELEASE ASSESSMENT FORM <sup>1</sup>

## If you have an emergency, Call 911

Handlers of hazardous materials are required to report releases. The following is a tool to be used for assessing if a release is reportable. Additionally, a non-reportable release incident form is provided to document why a release is not reported (see back).

### Questions for Incident Assessment:

YES NO

- |   |                          |                          |
|---|--------------------------|--------------------------|
| 1. Was anyone killed or injured, or did they require medical care or admitted to a hospital for observation?  | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. Did anyone, other than employees in the immediate area of the release, evacuate?   | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. Did the release cause off-site damage to public or private property?   | <input type="checkbox"/> | <input type="checkbox"/> |
| 4. Is the release greater than or equal to a reportable quantity (RQ)?  | <input type="checkbox"/> | <input type="checkbox"/> |
| 5. Was there an uncontrolled or unpermitted release to the air?   | <input type="checkbox"/> | <input type="checkbox"/> |
| 6. Did an uncontrolled or unpermitted release escape secondary containment, or extend into any sewers, storm water conveyance systems, utility vaults and conduits, wetlands, waterways, public roads, or off site?               | <input type="checkbox"/> | <input type="checkbox"/> |
| 7. Will control, containment, decontamination, and/or clean up require the assistance of federal, state, county, or municipal response elements?  | <input type="checkbox"/> | <input type="checkbox"/> |
| 8. Was the release or threatened release involving an unknown material or contains an unknown hazardous constituent?  | <input type="checkbox"/> | <input type="checkbox"/> |
| 9. Is the incident a threatened release (a condition creating a substantial probability of harm that requires immediate action to prevent, reduce, or mitigate damages to persons, property, or the environment)?                 | <input type="checkbox"/> | <input type="checkbox"/> |
| 10. Is there an increased potential for secondary effects including fire, explosion, line rupture, equipment failure, or other outcomes that may endanger or cause exposure to employees, the general public, or the environment? | <input type="checkbox"/> | <input type="checkbox"/> |

If the answer is YES to any of the above questions – report the release to the California Office of Emergency Services at 800-852-7550 and the local CUPA daytime: (619) 338-2284, after hours: (858) 565-5255. Note: other state and federal agencies may require notification depending on the circumstances.

\*Call 911 in an emergency\*

If all answers are NO, complete a Non Reportable Release Incident Form (page 2 of 2) and keep readily available. Documenting why a “no” response was made to each question will serve useful in the event questions are asked in the future, and to justify not reporting to an outside regulatory agency.

If in doubt, report the release.

<sup>1</sup> This document is a guide for accessing when hazardous materials release reporting is required by Chapter 6.95 of the California Health and Safety Code. It does not replace good judgment, Chapter 6.95, or other state or federal release reporting requirements.

# NON REPORTABLE RELEASE INCIDENT FORM

## 1. RELEASE AND RESPONSE DESCRIPTION

Incident # \_\_\_\_\_

Date/Time Discovered	Date/Time Discharge	Discharge Stopped <input type="checkbox"/> Yes <input type="checkbox"/> No
Incident Date / Time:		
Incident Business / Site Name:		
Incident Address:		
Other Locators (Bldg, Room, Oil Field, Lease, Well #, GIS)		
Please describe the incident and indicate specific causes and area affected. Photos Attached?: <input type="checkbox"/> Yes <input type="checkbox"/> No		
Indicate actions to be taken to prevent similar releases from occurring in the future.		

## 2. ADMINISTRATIVE INFORMATION

Supervisor in charge at time of incident:	Phone:
Contact Person:	Phone:

## 3. CHEMICAL INFORMATION

Chemical	Quantity <input type="checkbox"/> GAL <input type="checkbox"/> LBS <input type="checkbox"/> FT <sup>3</sup>
Chemical	Quantity <input type="checkbox"/> GAL <input type="checkbox"/> LBS <input type="checkbox"/> FT <sup>3</sup>
Chemical	Quantity <input type="checkbox"/> GAL <input type="checkbox"/> LBS <input type="checkbox"/> FT <sup>3</sup>
Clean-Up Procedures & Timeline:	
Completed By:	Phone:
Print Name:	Title:

**EMERGENCY RELEASE FOLLOW - UP NOTICE REPORTING FORM**

<b>A</b>	BUSINESS NAME	FACILITY EMERGENCY CONTACT & PHONE NUMBER ( ) -	
<b>B</b>	INCIDENT DATE MO DAY YR	TIME OES NOTIFIED (use 24 hr time)	OES CONTROL NO.
<b>C</b>	INCIDENT ADDRESS LOCATION	CITY / COMMUNITY	COUNTY ZIP
<b>D</b>	CHEMICAL OR TRADE NAME (print or type)	CAS Number	
<b>E</b>	CHECK IF CHEMICAL IS LISTED IN 40 CFR 355, APPENDIX A <input type="checkbox"/>	CHECK IF RELEASE REQUIRES NOTIFICATION UNDER 42 U.S.C. Section 9603 (a) <input type="checkbox"/>	
<b>F</b>	PHYSICAL STATE CONTAINED <input type="checkbox"/> SOLID <input type="checkbox"/> LIQUID <input type="checkbox"/> GAS	PHYSICAL STATE RELEASED <input type="checkbox"/> SOLID <input type="checkbox"/> LIQUID <input type="checkbox"/> GAS	QUANTITY RELEASED
<b>G</b>	ENVIRONMENTAL CONTAMINATION <input type="checkbox"/> AIR <input type="checkbox"/> WATER <input type="checkbox"/> GROUND <input type="checkbox"/> OTHER	TIME OF RELEASE	DURATION OF RELEASE — DAYS — HOURS — MINUTES
<b>H</b>	ACTIONS TAKEN		
<b>I</b>	KNOWN OR ANTICIPATED HEALTH EFFECTS (Use the comments section for addition information) <input type="checkbox"/> ACUTE OR IMMEDIATE (explain) _____ <input type="checkbox"/> CHRONIC OR DELAYED (explain) _____ <input type="checkbox"/> NOTKNOWN (explain) _____		
<b>J</b>	ADVICE REGARDING MEDICAL ATTENTION NECESSARY FOR EXPOSED INDIVIDUALS		
<b>K</b>	COMMENTS (INDICATE SECTION (A - G) AND ITEM WITH COMMENTS OR ADDITIONAL INFORMATION)		
<b>L</b>	CERTIFICATION: I certify under penalty of law that I have personally examined and I am familiar with the information submitted and believe the submitted information is true, accurate, and complete. REPORTING FACILITY REPRESENTATIVE (print or type) _____ SIGNATURE OF REPORTING FACILITY REPRESENTATIVE _____ DATE: _____		

## **EMERGENCY RELEASE FOLLOW-UP NOTICE REPORTING FORM INSTRUCTIONS**

### **GENERAL INFORMATION:**

Chapter 6.95 of Division 20 of the California Health and Safety Code requires that written emergency release follow-up notices prepared pursuant to 42 U.S.C. § 11004, be submitted using this reporting form. Non-permitted releases of reportable quantities of Extremely Hazardous Substances (listed in 40 CFR 355, appendix A) or of chemicals that require release reporting under section 103(a) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 [42 U.S.C. § 9603(a)] must be reported on the form, as soon as practicable, but no later than 30 days, following a release. The written follow-up report is required in addition to the verbal notification.

### **BASIC INSTRUCTIONS:**

- The form, when filled out, reports follow-up information required by 42 U.S.C § 11004. Ensure that all information requested by the form is provided as completely as possible.
- If the incident involves reportable releases of more than one chemical, prepare one report form for each chemical released.
- If the incident involves a series of separate releases of chemical(s) at different times, the releases should be reported on separate reporting forms.

### **SPECIFIC INSTRUCTIONS:**

**Block A:** Enter the name of the business and the name and phone number of a contact person who can provide detailed facility information concerning the release.

**Block B:** Enter the date of the incident and the time that verbal notification was made to OES. The OES control number is provided to the caller by OES at the time verbal notification is made. Enter this control number in the space provided.

**Block C:** Provide information pertaining to the location where the release occurred. Include the street address, the city or community, the county and the zip code.

**Block D:** Provide information concerning the specific chemical that was released. Include the chemical or trade name and the Chemical Abstract Service (CAS) number. Check all categories that apply. Provide best available information on quantity, time and duration of the release.

**Block E:** Indicate all actions taken to respond to and contain the release as specified in 42 U.S.C. § 11004(c).

**Block F:** Check the categories that apply to the health effects that occurred or could result from the release. Provide an explanation or description of the effects in the space provided. Use Block H for additional comments/information if necessary to meet requirements specified in 42 U.S.C. § 11004(c).

**Block G:** Include information on the type of medical attention required for exposure to the chemical released. Indicate when and how this information was made available to individuals exposed and to medical personnel, if appropriate for the incident, as specified in 42 U.S.C. § 11004(c).

**Block H:** List any additional pertinent information.

**Block I:** Print or type the name of the facility representative submitting the report. Include the official signature and the date that the form was prepared.

### **MAIL THE COMPLETED REPORT TO:**

**State Emergency Response Commission (SERC)  
Attn: Section 304 Reports  
Hazardous Materials Unit  
3650 Schriever Avenue  
Mather, CA 95655**

**NOTE:** Authority cited: Sections 25503, 25503.1 and 25507.1, Health and Safety Code. Reference: Sections 25503(b)(4), 25503.1, 25507.1, 25518 and 25520, Health and Safety Code.

**APPENDIX G**

**SAMPLE OF PUBLIC NOTICE**





CONSTRUCTION NOTICE

PROJECT TITLE

Work on your street will begin within one week to replace the existing water mains servicing your community.

The work will consist of:

- Saw-cutting and trench work on Ingulf Street from Morena Boulevard to Galveston Street to install new water mains, water laterals and fire hydrants.
• Streets where trenching takes place will be resurfaced and curb ramps will be upgraded to facilitate access for persons with disabilities where required.
• This work is anticipated to be complete in your community by December 2016.

How your neighborhood may be impacted:

- Water service to some properties during construction will be provided by a two-inch highline pipe that will run along the curb. To report a highline leak call 619-515-3525.
• Temporary water service disruptions are planned. If planned disruptions impact your property, you will receive advance notice.
• Parking restrictions will exist because of the presence of construction equipment and materials.
• "No Parking" signs will be displayed 72 hours in advance of the work.
• Cars parked in violation of signs will be TOWED.

Hours and Days of Operation:

Monday through Friday X:XX AM to X:XX PM.

City of San Diego Contractor:

Company Name, XXX-XXX-XXXX



CONSTRUCTION NOTICE

PROJECT TITLE

Work on your street will begin within one week to replace the existing water mains servicing your community.

The work will consist of:

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• Cars parked in violation of signs will be TOWED.

Hours and Days of Operation:

Monday through Friday X:XX AM to X:XX PM.

City of San Diego Contractor:

Company Name, XXX-XXX-XXXX

To contact the City of San Diego: SD Public Works 619-533-4207 | engineering@sandiego.gov | sandiego.gov/CIP

To contact the City of San Diego: SD Public Works 619-533-4207 | engineering@sandiego.gov | sandiego.gov/CIP

## APPENDIX H

### ADVANCED METERING INFRASTRUCTURE (AMI) DEVICE PROTECTION

## Protecting AMI Devices in Meter Boxes and on Street Lights

The Public Utilities Department (PUD) has begun the installation of the Advanced Metering Infrastructure (AMI) technology as a new tool to enhance water meter reading accuracy and efficiency, customer service and billing, and to be used by individual accounts to better manage the efficient use of water. **All AMI devices shall be protected per Section 5-2, "Protection", of the 2015 Whitebook.**

AMI technology allows water meters to be read electronically rather than through direct visual inspection by PUD field staff. This will assist PUD staff and customers in managing unusual consumption patterns which could indicate leaks or meter tampering on a customer's property.

Three of the main components of an AMI system are the:

- A. Endpoints, see Photo 1:

**Photo 1**



- B. AMI Antenna attached to Endpoint (antenna not always required), see Photo 2:

**Photo 2**



Network Devices, see Photo 3:

**Photo 3**



AMI endpoints transmit meter information to the AMI system and will soon be on the vast majority of meters in San Diego. These AMI devices provide interval consumption data to the PUD's Customer Support Division. If these devices are damaged or communication is interrupted, this Division will be alerted of the situation. The endpoints are installed in water meter boxes, coffins, and vaults adjacent to the meter. A separate flat round antenna may also be installed through the meter box lid. This antenna is connected to the endpoint via cable. The following proper installation shall be implemented when removing the lid to avoid damaging the antenna, cable, and/or endpoint. Photo 4 below demonstrates a diagram of the connection:

**Photo 4**





The AMI device ERT/Endpoint/Transmitter shall be positioned and installed as discussed in this Appendix. If the ERT/Endpoint/Transmitter is disturbed, it shall be re-installed and returned to its original installation with the end points pointed upwards as shown below in Photo 5.

**The PUD's code compliance staff will issue citations and invoices to you for any damaged AMI devices that are not re-installed as discussed in the Contract Document**

Photo 5 below shows a typical installation of an AMI endpoint on a water meter.

**Photo 5**

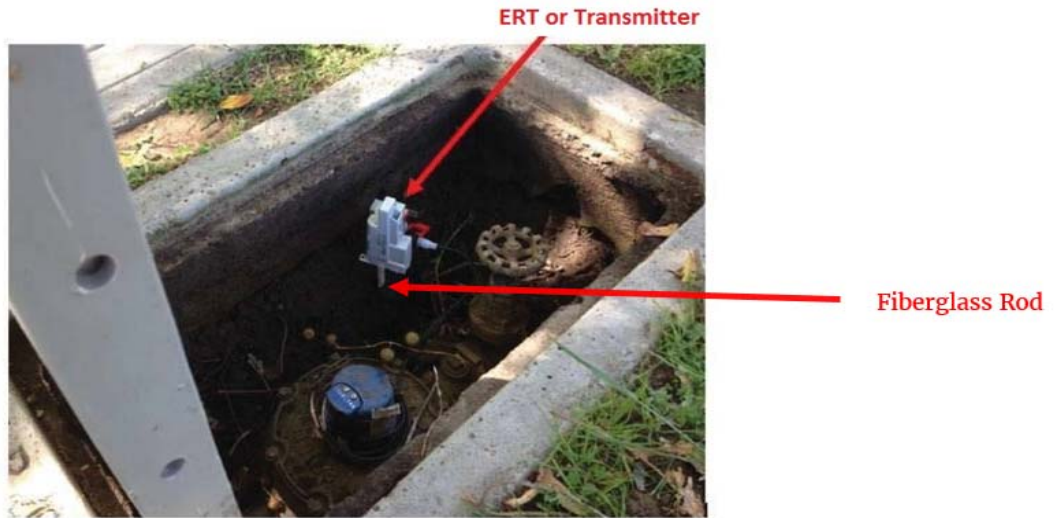


Photo 6 below is an example of disturbance that shall be avoided:

**Photo 6**



**You are responsible when working in and around meter boxes.** If you encounter these endpoints, use proper care and do not disconnect them from the registers on top of the water meter. If the lid has an antenna drilled through, do not change or tamper with the lid and inform the Resident Engineer immediately about the location of that lid. Refer to Photo 7 below:

**Photo 7**



Another component of the AMI system are the Network Devices. The Network Devices are strategically placed units (mainly on street light poles) that collect interval meter reading data from multiple meters for transmission to the Department Control Computer. **If you come across any of these devices on street lights that will be removed or replaced (refer to Photos 8 and 9 below), notify AMI Project Manager Arwa Sayed at (619) 362-0121 immediately.**

Photo 8 shows an installed network device on a street light. On the back of each Network Device is a sticker with contact information. See Photo 9. **Call PUD Water Emergency Repairs at 619-515-3525 if your work will impact these street lights.** These are assets that belong to the City of San Diego and you shall be responsible for any costs of disruption of this network.

**Photo 8**



**Network Device**

**Photo 9**



**If you encounter any bad installations, disconnected/broken/buried endpoints, or inadvertently damage any AMI devices or cables, notify the Resident Engineer immediately. The Resident Engineer will then immediately contact the AMI Project Manager, Arwa Sayed, at (619) 362-0121.**



**ATTACHMENT F**  
**INTENTIONALLY LEFT BLANK**

**ATTACHMENT G**

**CONTRACT AGREEMENT**

## CONTRACT AGREEMENT

---

### CONSTRUCTION CONTRACT

This contract is made and entered into between THE CITY OF SAN DIEGO, a municipal corporation, herein called "City", and Billbro Construction Company Inc., herein called "Contractor" for construction of; **Fire Station Number 3, 8 and 15 Renovations**; Bid No. **K-18-1557-DBB-3**; in the amount of Two Million Four Hundred Sixty Two Thousand Four Hundred Eighty Dollars and Zero Cents (\$2,462,480.00), which is comprised of the Base Bid.

IN CONSIDERATION of the payments to be made hereunder and the mutual undertakings of the parties hereto, City and Contractor agree as follows:

1. The following are incorporated into this contract as though fully set forth herein:
  - (a) The attached Faithful Performance and Payment Bonds.
  - (b) The attached Proposal included in the Bid documents by the Contractor.
  - (c) Reference Standards listed in the Instruction to Bidders and the Supplementary Special Provisions (SSP).
  - (d) That certain documents entitled **Fire Station Number 3, 8 and 15 Renovations**, on file in the office of the Public Works Department as Document No. **B-13187, S-10029, S-13011**, as well as all matters referenced therein.
2. The Contractor shall perform and be bound by all the terms and conditions of this contract and in strict conformity therewith shall perform and complete in a good and workmanlike manner **Fire Station Number 3, 8 and 15 Renovations**, Bid No. **K-18-1557-DBB-3**, San Diego, California.
3. For such performances, the City shall pay to Contractor the amounts set forth at the times and in the manner and with such additions or deductions as are provided for in this contract, and the Contractor shall accept such payment in full satisfaction of all claims incident to such performances.
4. No claim or suit whatsoever shall be made or brought by Contractor against any officer, agent, or employee of the City for or on account of anything done or omitted to be done in connection with this contract, nor shall any such officer, agent, or employee be liable hereunder.
5. This contract is effective as of the date that the Mayor or designee signs the agreement.

CONTRACT AGREEMENT (continued)

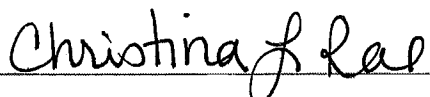
IN WITNESS WHEREOF, this Agreement is signed by the City of San Diego, acting by and through its Mayor or designee, pursuant to Municipal Code §22.3102 authorizing such execution.

THE CITY OF SAN DIEGO

APPROVED AS TO FORM

Mara W. Elliott, City Attorney

By 

By 

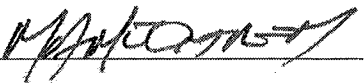
Print Name: Stephen Samara  
Principal Contract Specialist  
Public Works Department

Print Name: Christina L. Rae  
Deputy City Attorney

Date: April 18, 2018

Date: 4/20/18

CONTRACTOR

By 

Print Name: Maryory Contreras

Title: President

Date: 01/18/2018

City of San Diego License No.: B2013060627

State Contractor's License No.: 824679

DEPARTMENT OF INDUSTRIAL RELATIONS (DIR) REGISTRATION NUMBER: 1000051957

## CERTIFICATIONS AND FORMS

**The Bidder, by submitting its electronic bid, agrees to and certifies under penalty of perjury under the laws of the State of California, that the certifications, forms and affidavits submitted as part of this bid are true and correct.**

## **Bidder's General Information**

To the City of San Diego:

Pursuant to "Notice Inviting Bids", specifications, and requirements on file with the City Clerk, and subject to all provisions of the Charter and Ordinances of the City of San Diego and applicable laws and regulations of the United States and the State of California, the undersigned hereby proposes to furnish to the City of San Diego, complete at the prices stated herein, the items or services hereinafter mentioned. The undersigned further warrants that this bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that the bid is genuine and not collusive or sham; that the bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid, and has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or that anyone shall refrain from bidding; that the bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the bidder or any other bidder, or to fix any overhead, profit, or cost element of the bid price, or of that of any other bidder, or to secure any advantage against the public body awarding the contract of anyone interested in the proposed contract; that all statements contained in the bid are true; and, further, that the bidder has not, directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid, and will not pay, any fee to any corporation, partnership, company, association, organization, bid depository, or to any member or agent thereof to effectuate a collusive or sham bid.

The undersigned bidder(s) further warrants that bidder(s) has thoroughly examined and understands the entire Contract Documents (plans and specifications) and the Bidding Documents therefore, and that by submitting said Bidding Documents as its bid proposal, bidder(s) acknowledges and is bound by the entire Contract Documents, including any addenda issued thereto, as such Contract Documents incorporated by reference in the Bidding Documents.

**NON-COLLUSION AFFIDAVIT TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID UNDER 23  
UNITED STATES CODE 112 AND PUBLIC CONTRACT CODE 7106**

State of California

County of San Diego

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

## CONTRACTOR CERTIFICATION

---

### DRUG-FREE WORKPLACE

I hereby certify that I am familiar with the requirements of San Diego City Council Policy No. 100-17 regarding Drug-Free Workplace as outlined in the WHITEBOOK, Section 7-13.3, "Drug-Free Workplace", of the project specifications, and that;

This company\_has in place a drug-free workplace program that complies with said policy. I further certify that each subcontract agreement for this project contains language which indicates the subcontractor's agreement to abide by the provisions of subdivisions a) through c) of the policy as outlined.



## CONTRACTOR CERTIFICATION

---

### AMERICAN WITH DISABILITIES ACT (ADA) COMPLIANCE CERTIFICATION

I hereby certify that I am familiar with the requirements of San Diego City Council Policy No. 100-4 regarding the Americans With Disabilities Act (ADA) outlined in the WHITEBOOK, Section 7-13.2, "American With Disabilities Act", of the project specifications, and that:

This company has in place workplace program that complies with said policy. I further certify that each subcontract agreement for this project contains language which indicates the subcontractor's agreement to abide by the provisions of the policy as outlined.

## CONTRACTOR CERTIFICATION

---

### CONTRACTOR STANDARDS – PLEDGE OF COMPLIANCE

I declare under penalty of perjury that I am authorized to make this certification on behalf of the company submitting this bid/proposal, that as Contractor, I am familiar with the requirements of City of San Diego Municipal Code § 22.3004 regarding Contractor Standards as outlined in the WHITEBOOK, Section 7-13.4, ("Contractor Standards"), of the project specifications, and that Contractor has complied with those requirements.

I further certify that each of the Contractor's subcontractors whose subcontracts are greater than \$50,000 in value has completed a Pledge of Compliance attesting under penalty of perjury of having complied with City of San Diego Municipal Code § 22.3004.

## CONTRACTOR CERTIFICATION

---

### Equal Benefits Ordinance Certification

I declare under penalty of perjury that I am familiar with the requirements of and in compliance with the City of San Diego Municipal Code § 22.4300 regarding Equal Benefits Ordinance.

**AFFIDAVIT OF DISPOSAL**

(To be submitted upon completion of Construction pursuant to the contracts Certificate of Completion)

**WHEREAS**, on the \_\_\_\_\_ DAY OF \_\_\_\_\_, 2\_\_\_\_\_ the undersigned entered into and executed a contract with the City of San Diego, a municipal corporation, for:

**Fire Station Number 3, 8 and 15 Renovations**

(Name of Project or Task)

as particularly described in said contract and identified as Bid No. **K-18-1557-DBB-3**; SAP No. (WBS/IO/CC) **B-13187, S-10029, S-13011**; and **WHEREAS**, the specification of said contract requires the Contractor to affirm that "all brush, trash, debris, and surplus materials resulting from this project have been disposed of in a legal manner"; and **WHEREAS**, said contract has been completed and all surplus materials disposed of:

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

**NOW, THEREFORE**, in consideration of the final payment by the City of San Diego to said Contractor under the terms of said contract, the undersigned Contractor, does hereby affirm that all surplus materials as described in said contract have been disposed of at the following location(s)

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

and that they have been disposed of according to all applicable laws and regulations.

Dated this \_\_\_\_\_ DAY OF \_\_\_\_\_, \_\_\_\_\_.

By: \_\_\_\_\_  
Contractor

**ATTEST:**

State of \_\_\_\_\_ County of \_\_\_\_\_

On this \_\_\_\_\_ DAY OF \_\_\_\_\_, 2\_\_\_\_\_, before the undersigned, a Notary Public in and for said County and State, duly commissioned and sworn, personally appeared \_\_\_\_\_ known to me to be the \_\_\_\_\_ Contractor named in the foregoing Release, and whose name is subscribed thereto, and acknowledged to me that said Contractor executed the said Release.

Notary Public in and for said County and State

**LIST OF SUBCONTRACTORS**

**\*\*\* PROVIDED FOR ILLUSTRATIVE PURPOSES ONLY \*\*\* TO BE SUBMITTED IN ELECTRONIC FORMAT ONLY \*\*\* SEE INSTRUCTIONS TO BIDDERS, FOR FURTHER INFORMATION**

In accordance with the requirements of the "Subletting and Subcontracting Fair Practices Act", Section 4100, of the California Public Contract Code (PCC), the Bidder is to list below the name, address and license number of each Subcontractor who will perform work, labor, render services or specially fabricate and install a portion [type] of the work or improvement, in an amount of or in excess of 0.5% of the Contractor's total Bid. Failure to comply with this requirement may result in the Bid being rejected as non-responsive. The Contractor is to list only one Subcontractor for each portion of the Work. The Bidder's attention is directed to the Special Provisions - General; Paragraph 2-3 Subcontracts, which stipulates the percentage of the Work to be performed with the Bidder's own forces. The Bidder is to also list all SLBE, ELBE, DBE, DVBE, MBE, WBE, OBE, SDB, WoSB, HUBZone, and SDVOSB Subcontractors for which the Bidders are seeking recognition towards achieving any mandatory, voluntary, or both subcontracting participation percentages.

NAME, ADDRESS AND TELEPHONE NUMBER OF SUBCONTRACTOR	DIR Registration Number	CONSTRUCTOR OR DESIGNER	SUBCONTRACT OR LICENSE NUMBER	TYPE OF WORK	DOLLAR VALUE OF SUBCONTRACT	MBE, WBE, DBE, DVBE, OBE, ELBE, SLBE, SDB, WoSB, HUBZone, OR SDVOSB®	WHERE CERTIFIED ②	CHECK IF JOINT VENTURE PARTNERSHIP
Name: _____ Address: _____ City: _____ State: _____ Zip: _____ Phone: _____ Email: _____								
Name: _____ Address: _____ City: _____ State: _____ Zip: _____ Phone: _____ Email: _____								

① As appropriate, Bidder shall identify Subcontractor as one of the following and shall include a valid proof of certification (except for OBE, SLBE and ELBE):

Certified Minority Business Enterprise	MBE	Certified Woman Business Enterprise	WBE
Certified Disadvantaged Business Enterprise	DBE	Certified Disabled Veteran Business Enterprise	DVBE
Other Business Enterprise	OBE	Certified Emerging Local Business Enterprise	ELBE
Certified Small Local Business Enterprise	SLBE	Small Disadvantaged Business	SDB
Woman-Owned Small Business	WoSB	HUBZone Business	HUBZone
Service-Disabled Veteran Owned Small Business	SDVOSB		

② As appropriate, Bidder shall indicate if Subcontractor is certified by:

City of San Diego	CITY	State of California Department of Transportation	CALTRANS
California Public Utilities Commission	CPUC		
State of California's Department of General Services	CADoGS	City of Los Angeles	LA
State of California	CA	U.S. Small Business Administration	SBA

**The Bidder will not receive any subcontracting participation percentages if the Bidder fails to submit the required proof of certification.**

**NAMED EQUIPMENT/MATERIAL SUPPLIER LIST**

**\*\*\* PROVIDED FOR ILLUSTRATIVE PURPOSES ONLY \*\*\* TO BE SUBMITTED IN ELECTRONIC FORMAT ONLY \*\*\* SEE INSTRUCTIONS TO BIDDERS FOR FURTHER INFORMATION**

NAME, ADDRESS AND TELEPHONE NUMBER OF VENDOR/SUPPLIER	DIR Registration Number	MATERIALS OR SUPPLIES	DOLLAR VALUE OF MATERIAL OR SUPPLIES	SUPPLIER (Yes/No)	MANUFACTURER (Yes/No)	MBE, WBE, DBE, DVBE, OBE, ELBE, SLBE, SDB, WoSB, HUBZone, OR SDVOSB <sup>①</sup>	WHERE CERTIFIED <sup>②</sup>
Name: _____ Address: _____ City: _____ State: _____ Zip: _____ Phone: _____ Email: _____							
Name: _____ Address: _____ City: _____ State: _____ Zip: _____ Phone: _____ Email: _____							

① As appropriate, Bidder shall identify Vendor/Supplier as one of the following and shall include a valid proof of certification (except for OBE,SLBE and ELBE):

Certified Minority Business Enterprise	MBE	Certified Woman Business Enterprise	WBE
Certified Disadvantaged Business Enterprise	DBE	Certified Disabled Veteran Business Enterprise	DVBE
Other Business Enterprise	OBE	Certified Emerging Local Business Enterprise	ELBE
Certified Small Local Business Enterprise	SLBE	Small Disadvantaged Business	SDB
Woman-Owned Small Business	WoSB	HUBZone Business	HUBZone
Service-Disabled Veteran Owned Small Business	SDVOSB		

② As appropriate, Bidder shall indicate if Vendor/Supplier is certified by:

City of San Diego	CITY	State of California Department of Transportation	CALTRANS
California Public Utilities Commission	CPUC		
State of California's Department of General Services	CADoGS	City of Los Angeles	LA
State of California	CA	U.S. Small Business Administration	SBA

**The Bidder will not receive any subcontracting participation percentages if the Bidder fails to submit the required proof of certification.**

## **ELECTRONICALLY SUBMITTED FORMS**

### **THE FOLLOWING FORMS MUST BE SUBMITTED IN PDF FORMAT WITH BID SUBMISSION**

The following forms are to be completed by the bidder and submitted (uploaded) electronically with the bid in PlanetBids.

- A. BID BOND – See Instructions to Bidders, Bidders Guarantee of Good Faith (Bid Security) for further instructions**
  
- B. CONTRACTOR’S CERTIFICATION OF PENDING ACTIONS**

**Bids will not be accepted until ALL forms are submitted as part of the bid submittal**

**BID BOND**

**See Instructions to Bidders, Bidder Guarantee of Good Faith  
(Bid Security)**

KNOW ALL MEN BY THESE PRESENTS,

That Bilbro Construction Company, Inc., 876 North Broadway, Escondido, CA 92025 as Principal, and Arch Insurance Company, Harborside 3, 210 Hudson Street, Suite 300, Jersey City, NJ 07311-1107 as Surety, are held and firmly bound unto The City of San Diego hereinafter called "OWNER," in the sum of **10% OF THE TOTAL BID AMOUNT** 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.

WHEREAS, said Principal has submitted a Bid to said OWNER to perform the WORK required under the bidding schedule(s) of the OWNER's Contract Documents entitled

FIRE STATION NUMBER 3, 8 AND 15 RENOVATIONS

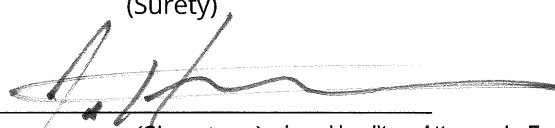
NOW THEREFORE, if said Principal is awarded a contract by said OWNER and, within the time and in the manner required in the "Notice Inviting Bids" enters into a written Agreement on the form of agreement bound with said Contract Documents, furnishes the required certificates of insurance, and furnishes the required Performance Bond and Payment Bond, then this obligation shall be null and void, otherwise it shall remain in full force and effect. In the event suit is brought upon this bond by said OWNER and OWNER prevails, said Surety shall pay all costs incurred by said OWNER in such suit, including a reasonable attorney's fee to be fixed by the court.

SIGNED AND SEALED, this 29th day of November, 2017

Bilbro Construction Company, Inc. (SEAL)  
(Principal)

Arch Insurance Company (SEAL)  
(Surety)

By:   
(Signature) Maryory Contreras, President

By:   
(Signature) Jase Hamilton, Attorney-in-Fact

(SEAL AND NOTARIAL ACKNOWLEDGEMENT OF SURETY)



**THIS POWER OF ATTORNEY IS NOT VALID UNLESS IT IS PRINTED ON BLUE BACKGROUND.**

***This Power of Attorney limits the acts of those named herein, and they have no authority to bind the Company except in the manner and to the extent herein stated. Not valid for Mortgage, Note, Loan, Letter of Credit, Bank Deposit, Currency Rate, Interest Rate or Residential Value Guarantees.***

**POWER OF ATTORNEY**

Know All Persons By These Presents:

That the Arch Insurance Company, a corporation organized and existing under the laws of the State of Missouri, having its principal administrative office in Jersey City, New Jersey (hereinafter referred to as the "Company") does hereby appoint:

Erin A. Greene, James P. Schabarum II, Jase Hamilton, Jeffrey W. Cavnac and Julie A. Brennan of San Diego, CA (EACH)

its true and lawful Attorney(s)in-Fact, to make, execute, seal, and deliver from the date of issuance of this power for and on its behalf as surety, and as its act and deed:

Any and all bonds, undertakings, recognizances and other surety obligations, in the penal sum not exceeding Ninety Million Dollars (\$90,000,000.00).

This authority does not permit the same obligation to be split into two or more bonds In order to bring each such bond within the dollar limit of authority as set forth herein.

The execution of such bonds, undertakings, recognizances and other surety obligations in pursuance of these presents shall be as binding upon the said Company as fully and amply to all intents and purposes, as if the same had been duly executed and acknowledged by its regularly elected officers at its principal administrative office in Jersey City, New Jersey.

This Power of Attorney is executed by authority of resolutions adopted by unanimous consent of the Board of Directors of the Company on September 15, 2011, true and accurate copies of which are hereinafter set forth and are hereby certified to by the undersigned Secretary as being in full force and effect:

"VOTED, That the Chairman of the Board, the President, or the Executive Vice President, or any Senior Vice President, of the Surety Business Division, or their appointees designated in writing and filed with the Secretary, or the Secretary shall have the power and authority to appoint agents and attorneys-in-fact, and to authorize them subject to the limitations set forth in their respective powers of attorney, to execute on behalf of the Company, and attach the seal of the Company thereto, bonds, undertakings, recognizances and other surety obligations obligatory in the nature thereof, and any such officers of the Company may appoint agents for acceptance of process."

This Power of Attorney is signed, sealed and certified by facsimile under and by authority of the following resolution adopted by the unanimous consent of the Board of Directors of the Company on September 15, 2011:

VOTED, That the signature of the Chairman of the Board, the President, or the Executive Vice President, or any Senior Vice President, of the Surety Business Division, or their appointees designated in writing and filed with the Secretary, and the signature of the Secretary, the seal of the Company, and certifications by the Secretary, may be affixed by facsimile on any power of attorney or bond executed pursuant to the resolution adopted by the Board of Directors on September 15, 2011, and any such power so executed, sealed and certified with respect to any bond or undertaking to which it is attached, shall continue to be valid and binding upon the Company.

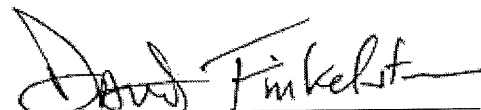
In Testimony Whereof, the Company has caused this instrument to be signed and its corporate seal to be affixed by their authorized officers, this 11<sup>th</sup> day of September, 2017.

Attested and Certified

Arch Insurance Company

  
Patrick K. Nails, Secretary

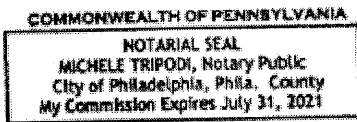


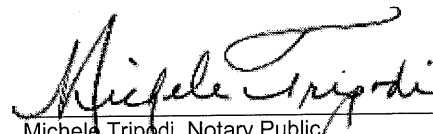
  
David M. Finkelstein, Executive Vice President

STATE OF PENNSYLVANIA SS

COUNTY OF PHILADELPHIA SS

I, Michele Tripodi, a Notary Public, do hereby certify that Patrick K. Nails and David M. Finkelstein personally known to me to be the same persons whose names are respectively as Secretary and Executive Vice President of the Arch Insurance Company, a Corporation organized and existing under the laws of the State of Missouri, subscribed to the foregoing instrument, appeared before me this day in person and severally acknowledged that they being thereunto duly authorized signed, sealed with the corporate seal and delivered the said instrument as the free and voluntary act of said corporation and as their own free and voluntary acts for the uses and purposes therein set forth.



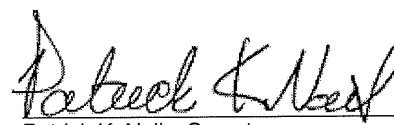
  
Michele Tripodi, Notary Public  
My commission expires 07/31/2021

CERTIFICATION

I, Patrick K. Nails, Secretary of the Arch Insurance Company, do hereby certify that the attached Power of Attorney dated September 11, 2017 on behalf of the person(s) as listed above is a true and correct copy and that the same has been in full force and effect since the date thereof and is in full force and effect on the date of this certificate; and I do further certify that the said David M. Finkelstein, who executed the Power of Attorney as Executive Vice President, was on the date of execution of the attached Power of Attorney the duly elected Executive Vice President of the Arch Insurance Company.

IN TESTIMONY WHEREOF, I have hereunto subscribed my name and affixed the corporate seal of the Arch Insurance Company on this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_\_.

NOV 29 2017

  
Patrick K. Nails, Secretary

This Power of Attorney limits the acts of those named therein to the bonds and undertakings specifically named therein and they have no authority to bind the Company except in the manner and to the extent herein stated.

**PLEASE SEND ALL CLAIM INQUIRIES RELATING TO THIS BOND TO THE FOLLOWING ADDRESS:**

Arch Insurance – Surety Division  
3 Parkway, Suite 1500  
Philadelphia, PA 19102



# CALIFORNIA ALL- PURPOSE CERTIFICATE OF 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 San Diego }

On NOV 29 2017 before me, Erin Ashley Greene, Notary Public,  
(Here insert name and title of the officer)

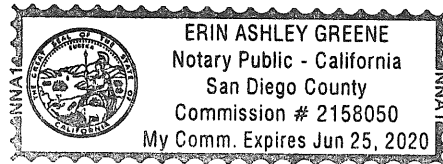
personally appeared Jase Hamilton,  
who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) (s) are subscribed to the within instrument and acknowledged to me that (he) (she) (they) executed the same in (his) (her) (their) authorized capacity(ies), and that by (his) (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.

[Signature]  
Notary Public Signature

(Notary Public Seal)



## ADDITIONAL OPTIONAL INFORMATION

DESCRIPTION OF THE ATTACHED DOCUMENT

\_\_\_\_\_

(Title or description of attached document)

\_\_\_\_\_

(Title or description of attached document continued)

Number of Pages \_\_\_\_\_ Document Date \_\_\_\_\_

## CAPACITY CLAIMED BY THE SIGNER

- Individual (s)  
 Corporate Officer

\_\_\_\_\_ (Title)

- Partner(s)  
 Attorney-in-Fact  
 Trustee(s)  
 Other \_\_\_\_\_

## INSTRUCTIONS FOR COMPLETING THIS FORM

*This form complies with current California statutes regarding notary wording and, if needed, should be completed and attached to the document. Acknowledgments from other states may be completed for documents being sent to that state so long as the wording does not require the California notary to violate California notary law.*

- State and County information must be the State and County where the document signer(s) personally appeared before the notary public for acknowledgment.
- Date of notarization must be the date that the signer(s) personally appeared which must also be the same date the acknowledgment is completed.
- The notary public must print his or her name as it appears within his or her commission followed by a comma and then your title (notary public).
- Print the name(s) of document signer(s) who personally appear at the time of notarization.
- Indicate the correct singular or plural forms by crossing off incorrect forms (i.e. ~~he/she/they~~, is /are ) or circling the correct forms. Failure to correctly indicate this information may lead to rejection of document recording.
- The notary seal impression must be clear and photographically reproducible. Impression must not cover text or lines. If seal impression smudges, re-seal if a sufficient area permits, otherwise complete a different acknowledgment form.
- Signature of the notary public must match the signature on file with the office of the county clerk.
  - ❖ Additional information is not required but could help to ensure this acknowledgment is not misused or attached to a different document.
  - ❖ Indicate title or type of attached document, number of pages and date.
  - ❖ Indicate the capacity claimed by the signer. If the claimed capacity is a corporate officer, indicate the title (i.e. CEO, CFO, Secretary).
- Securely attach this document to the signed document with a staple.

### CONTRACTOR'S CERTIFICATION OF PENDING ACTIONS

As part of its bid or proposal (Non-Price Proposal in the case of Design-Build contracts), the Bidder shall provide to the City a list of all instances within the past 10 years where a complaint was filed or pending against the Bidder in a legal or administrative proceeding alleging that Bidder discriminated against its employees, subcontractors, vendors or suppliers, and a description of the status or resolution of that complaint, including any remedial action taken.

CHECK ONE BOX ONLY.

- The undersigned certifies that within the past 10 years the Bidder has NOT been the subject of a complaint or pending action in a legal administrative proceeding alleging that Bidder discriminated against its employees, subcontractors, vendors or suppliers.
- The undersigned certifies that within the past 10 years the Bidder has been the subject of a complaint or pending action in a legal administrative proceeding alleging that Bidder discriminated against its employees, subcontractors, vendors or suppliers. A description of the status or resolution of that complaint, including any remedial action taken and the applicable dates is as follows:

DATE OF CLAIM	LOCATION	DESCRIPTION OF CLAIM	LITIGATION (Y/N)	STATUS	RESOLUTION/REMEDIAL ACTION TAKEN

Contractor Name: Bilbro Construction Company Inc.

Certified By Maryory Contreras Title President

Name

  
Signature

Date 12/14/2017

**USE ADDITIONAL FORMS AS NECESSARY**

**Bid Results****Bidder Details**

**Vendor Name** Bilbro Construction Company Inc.  
**Address** 876 N Broadway  
 Escondido, CA 92025  
 United States

**Respondee** Carson Allen  
**Respondee Title** Estimator  
**Phone** 760-871-0477 Ext. 31  
**Email** callen@bilbroconstruction.com

**Vendor Type** PQUAL,CADIR,WOSB,Local  
**License #** 824679  
**CADIR** 1000051957

**Bid Detail**

**Bid Format** Electronic  
**Submitted** December 21, 2017 1:57:11 PM (Pacific)  
**Delivery Method**  
**Bid Responsive**  
**Bid Status** Submitted  
**Confirmation #** 125168  
**Ranking** 0

**Respondee Comment****Buyer Comment****Attachments**

File Title	File Name	File Type
Certification of Pending Actions	Certification of Pending Actions.pdf	Contractor's Certification of Pending Actions
Bid Bond	Bid Bond.pdf	Bid Bond

**Line Items**

Type	Item Code	UOM	Qty	Unit Price	Line Total	Comment
<b>Main Bid FS15</b>						
1	Bonds (Payment and Performance)					
	524126	LS	1	\$12,900.00	\$12,900.00	
2	Building Permits (EOC Type I) and Staging Required Permits					
	236220	AL	1	\$10,000.00	\$10,000.00	
3	Construction of Fire Station No. 15 Building Improvements					
	238210	LS	1	\$491,500.00	\$491,500.00	
4	Exterior Site Improvements					
	237110	LS	1	\$56,100.00	\$56,100.00	
5	Demolition					
	238910	LS	1	\$28,800.00	\$28,800.00	

**Bid Results**

Type	Item Code	UOM	Qty	Unit Price	Line Total	Comment
6	Asbestos and Lead Containing Material Abatement (EOC Type I)					
	238990	AL	1	\$10,000.00	\$10,000.00	
7	Field Orders (EOC Type II)					
		AL	1	\$20,000.00	\$20,000.00	
8	Water Pollution Control Program Development					
	541330	LS	1	\$860.00	\$860.00	
9	Water Pollution Control Program Implementation					
	237110	LS	1	\$5,700.00	\$5,700.00	
10	Communication and Security					
	238210	LS	1	\$7,100.00	\$7,100.00	
11	Termite Treatment / Structural Damage Replacement (EOC Type I)					
	562910	AL	1	\$2,000.00	\$2,000.00	
				<b>Subtotal</b>	<b>\$644,960.00</b>	
	<b>Main Bid FS 3</b>					
12	Bonds (Payment and Performance)					
	524126	LS	1	\$12,900.00	\$12,900.00	
13	Building Permits (EOC Type I) and Staging Required Permits					
	236220	AL	1	\$10,000.00	\$10,000.00	
14	Construction of Fire Station No. 3 Building Improvements					
	238210	LS	1	\$756,000.00	\$756,000.00	
15	Exterior Site Improvements					
	237110	LS	1	\$202,600.00	\$202,600.00	
16	Demolition					
	238910	LS	1	\$32,700.00	\$32,700.00	
17	Asbestos and Lead Containing Material abatement (EOC Type I)					
	238990	AL	1	\$10,000.00	\$10,000.00	
18	Field Orders (EOC Type II)					
		AL	1	\$50,000.00	\$50,000.00	
19	Water Pollution Control Program Development					
	541330	LS	1	\$860.00	\$860.00	
20	Water Pollution Control Program Implementation					
	237110	LS	1	\$5,700.00	\$5,700.00	

**Bid Results**

Type	Item Code	UOM	Qty	Unit Price	Line Total	Comment
21	Communication and Security					
	238210	LS	1	\$7,200.00	\$7,200.00	
22	Termite Treatment / Structural Damage Replacement (EOC Type I)					
	562910	AL	1	\$2,000.00	\$2,000.00	
<b>Subtotal</b>					<b>\$1,089,960.00</b>	
<b>Main Bid FS 8</b>						
23	Bonds (Payment and Performance)					
	524126	LS	1	\$12,900.00	\$12,900.00	
24	Building Permits (EOC Type I) and Staging Required Permits					
	236220	AL	1	\$10,000.00	\$10,000.00	
25	Construction of Fire Station No. 8 Building Improvements					
	238210	LS	1	\$508,500.00	\$508,500.00	
26	Exterior Site Improvements					
	237110	LS	1	\$123,300.00	\$123,300.00	
27	Demolition					
	238910	LS	1	\$22,100.00	\$22,100.00	
28	Asbestos and Lead Containing Material abatement (EOC Type I)					
	238990	AL	1	\$5,000.00	\$5,000.00	
29	Field Orders (EOC Type II)					
		AL	1	\$30,000.00	\$30,000.00	
30	Water Pollution Control Program Development					
	541330	LS	1	\$860.00	\$860.00	
31	Water Pollution Control Program Implementation					
	237110	LS	1	\$5,700.00	\$5,700.00	
32	Communication and Security					
	238210	LS	1	\$7,200.00	\$7,200.00	
33	Termite Treatment / Structural Damage Replacement (EOC Type I)					
	562910	AL	1	\$2,000.00	\$2,000.00	
<b>Subtotal</b>					<b>\$727,560.00</b>	
<b>Total</b>					<b>\$2,462,480.00</b>	

**Subcontractors**

Name & Address	Description	License Num	CADIR	Amount	Type
<b>Precision Electric Company</b> 8137 Winter Gardens Company Lakeside, CA 92040 United States	Electrical	534116	1000002037	\$187,000.00	
<b>Commercial Openings, Inc.</b> 9711 Cactus Street Lakeside, CA 92040 United States	Doors/frames/hardware	878161	1000002898	\$50,683.00	CADIR

PlanetBids, Inc.

**Bid Results**

<b>Name &amp; Address</b>	<b>Description</b>	<b>License Num</b>	<b>CADIR</b>	<b>Amount</b>	<b>Type</b>
<b>A Good Roofer, Inc.</b> 11651 Riverside Drive Suite 145 Lakeside, CA 92040 United States	Roofing	685015	1000000746	\$24,600.00	PQUAL,CADIR
<b>L C Paving &amp; Sealing, Inc.</b> 996 Borden Rd San Marcos, CA 92069 United States	Demolition-site, Asphalt,Site concrete,pavement markings,fencing	621610	1000004325	\$160,000.00	LAT,MALE,SLBE,D BE,MBE,CADIR,PQU AL
<b>Paul J Construction Corp.</b> 29521 Ynez Road Temecula, CA 92592 United States	Plumbing	865017	1000033348	\$122,744.00	
<b>La Mesa Flooring Co</b> 8772 La Mesa Blvd La Mesa, CA 91942 United States	Flooring-Ceramic Tile/resilient	1023494	1000034968	\$88,276.00	
<b>Powerwashing Unlimited.Inc.</b> 8862 Greenridge Avenue, Spring Valley, CA, 91977 Spring Valley, CA 91977 United States	Concrete-Building, Painting	866560	1000024999	\$102,000.00	
<b>New Star International Inc</b> 807 E Orangethorpe Ste B anaheim, CA 92801 United States	Casework	969575	100013503	\$56,000.00	CAU,MALE
<b>Hutchison Mechanical</b> 2913 Verde View Rd. Alpine, CA 91901 United States	HVAC	976480	1000037202	\$178,240.00	CADIR,CAU,ELBE, MALE
<b>Walter N. Coffman, Inc.</b> 5180 Naranja St San Diego, CA 92114 United States	plaster	781707	1000007698	\$36,444.00	